Gas Journal

VOL. 292. 109th YEAR. LONDON, NOVEMBER 6, 1957. No 4921 PRICE 1/6

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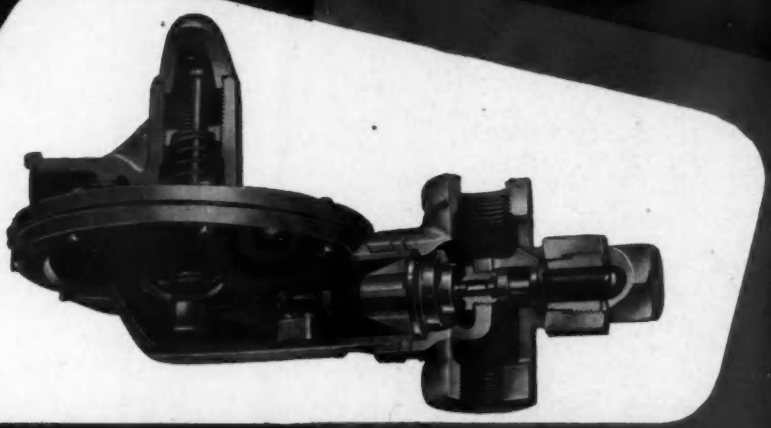

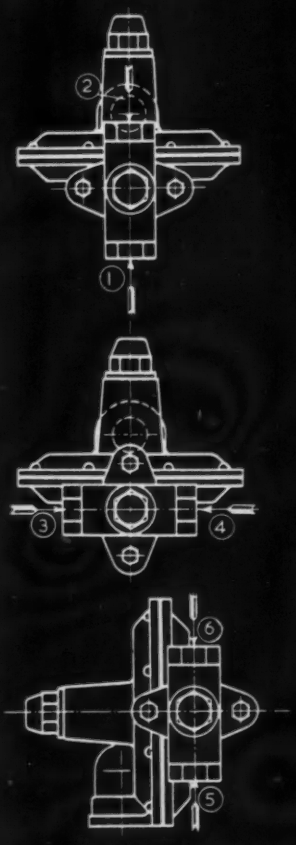

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HIGH PRESSURE GAS SERVICE REGULATOR

This regulator is of a new design developed for mass production by modern methods, which allow seven main types of regulators to be produced, covering a very wide range of individual requirements, but utilising generally the same main components.

The regulator is suitable for controlling the gas supply to domestic premises from high pressure mains, or low to medium or high pressure mains.

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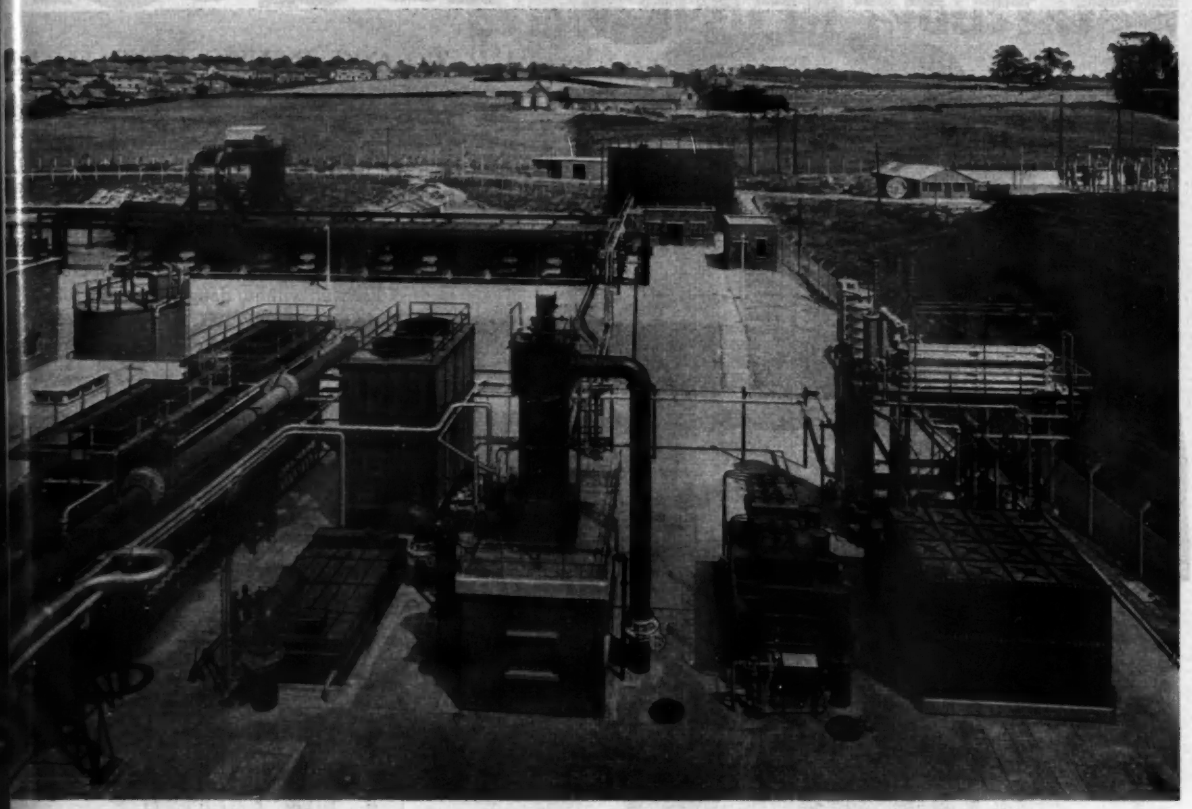

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designed, engineered and erected the complete Gas Treatment Plant comprising . . .

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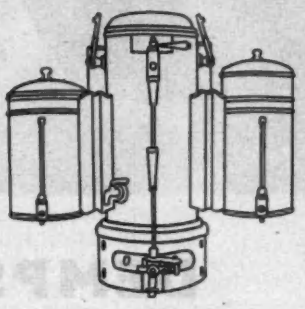
CONSTANT boiling water

— UP TO 600 PINTS PER HOUR

The Aquafont Automatic Water Boiler is designed to operate efficiently in hard or soft water districts. The Boiler of heavy gauge copper construction is fitted with a patented safety gas cock and automatic water feed, and is foolproof in operation. Gas is only consumed when boiling water is required. These boilers can be operated by unskilled staff without danger. Manufactured in four sizes to supply 200, 300, 400, or 600 pints of boiling water per hour.

WITH THE **Aquafont** *AUTOMATIC* WATER BOILERS



The Aquafont Cafe Set is identical in design to the boiler with the addition of earthenware, Pyrex or stainless steel lined side urns, water jacketed from main boiler, or can be independently heated in addition by small auxiliary burner. All units can be supplied for operation by liquid gas.

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Please send full particulars of the above item together with the address of our nearest supplier

Please 'tick' below other items of catering equipment of which you would like full particulars.

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The ABP-KLONNE type of gasholder has a dry seal which eliminates the use of tar and incorporates a self-operating system of lubrication controlled by the piston movement. The WIGGINS gasholder is the only one with an absolutely dry frictionless seal; and it does not use water, tar or grease. Operating costs and maintenance problems are, therefore, virtually non-existent. Water-sealed gasholders—both column and spiral guided—can be designed to contain gas in small and large capacities.

240

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Please send for your free copy of the 'Apexior Manual'

Fifty years ago when '*Apexior*' was introduced, the idea that a film coating on the internal surfaces of boilers could completely prevent corrosion was received with considerable scepticism.

Proof that it could, however, was soon provided. And so, for fifty years the world's leading boilermakers and engineers have relied on '*Apexior Number* 1' for protecting the internal surfaces of boilers, steam pipes, hot water tanks—wherever wet-heat temperatures between 175° and 1000°F. are encountered. For cold-wet surfaces below 125°F. and especially for the stern parts of ships, '*Apexior Number* 3' is equally relied upon and renowned.

Every vessel in the Cunard Fleet, including the mighty '*Queens*', and many Great Ships of other lines, rely upon '*Apexior Number* 1,' '*Apexior Number* 3'—or, more often, both. The boilers of great Power Stations, too, such as Battersea, are kept free of corrosion by '*Apexior Number* 1'. The list of '*Apexior*' users reads like the 'Who's Who' of industrial plants, public utilities, boiler makers, railroads and steamship lines.

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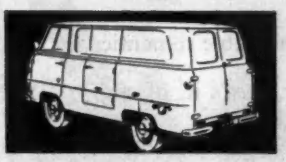
SEE YOUR DEALER FOR FULL DETAILS AND A DEMONSTRATION DRIVE.

New in precision construction and balance . . . new in advanced design . . . new in forward control, with 75% payload capacity . . . new in low-loading height . . . new in functional styling . . . new in advanced mechanical features.

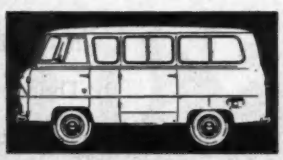
PLUS THESE EXTRA NEW FEATURES . . .

NEW all-steel construction. Ladder-type steel chassis frame (perfect for mounting special bodies). Full width *double* rear door opening with optional side loading door if required. 'Level-ride' suspension. Hydraulic brakes—area 147 sq. inches—the biggest! Over-square 1703 c.c. engine. Replaceable bottom body panel in case of accidental damage. Foam rubber seating, and, for the first time ever, a 'step-in' entrance by either front door! Fine all-round standards of driver comfort. Excellent visibility through the large single-piece curved windscreen. Easy serviceability. Effortless manoeuvrability. Quick lever-type handbrake. Efficient twin windscreen wipers with overlapping arcs . . . and, of course, the two immense advantages of any Ford product—LOW INITIAL COST AND LOW RUNNING COSTS WITH FORD SERVICE.

Discover *all* the advanced features of the New Thames '5-Star' range for Butcher, Baker and Candlestick Maker at any FORD DEALER—TODAY!



The new range includes a rear loading van—a rear and side-loading van—a chassis and cab—a chassis and cab fittings—and a chassis and front end. ½ rear bumpers factory fitted as optional extras.



AVAILABLE SOON — standard and de Luxe Estate cars. The new Thames chassis permits Ford to offer an ideal 8/10 seater passenger vehicle with full width twin rear doors, and side entrance with retractable steps.

a ***NEW*** '5-Star' range from

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the best at lowest cost

FORD MOTOR COMPANY LIMITED · DAGENHAM

The case of the Missing Bridge

"Perhaps it was *burned* down, Holmlock."

"Oh come, My Dear Watnot, where are the 'vestigia'—the charred remains. This is the work of a master organization: no débris, not a solitary fingerprint—only that cryptic sign "600" at the bridge approaches."

"A magic number, perhaps, Holmlock . . . "

"What an incurable romantic you are, Wat——— By Thunder, that's it, of course. When it comes to dismantling work, "600" is the nearest thing to magic that there is."

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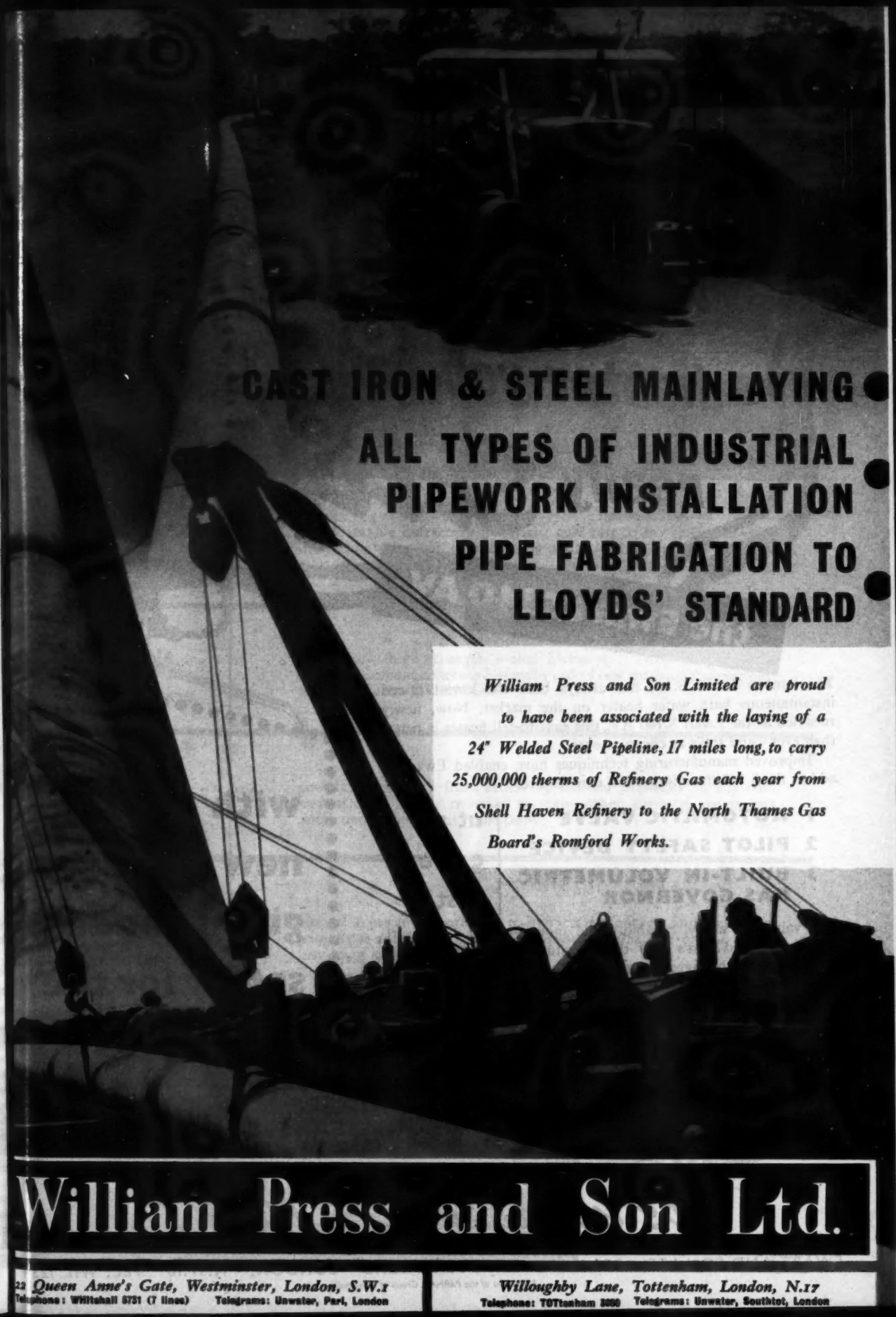

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the Ewart S.140 AV

The famous Ewart S.140 has always been the lowest priced instantaneous bath water heater on the market. Now, newly re-styled as the Ewart S.140 AV, this easy-to-sell heater is better than ever—and stays as cheap as ever!

Improved manufacturing techniques have enabled Ewart to add to the S.140 these important new features:—

1 AUTOMATIC VALVE
2 PILOT SAFETY DEVICE
3 BUILT-IN VOLUMETRIC GAS GOVERNOR

at no extra cost!

Top value for safety, reliability and money—that's the Ewart S.140 AV. And that's why the introduction of this splendid heater presents the biggest opportunity for years for gas salesmen to sell bath water heating by gas—the *EWART* way.

Display the Ewart S.140 AV in your showrooms. Full details and specification available on request to the manufacturers.

with *three* new features giving added safety for the same low cost!

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THE CEMENT FOR INDUSTRY

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* **Refractory Concrete . . .** USING FIREBRICK AGGREGATE	. . . . The adaptable Refractory material · cold cast to any shape without distortion · non-spalling and stable under load up to 1300°C.
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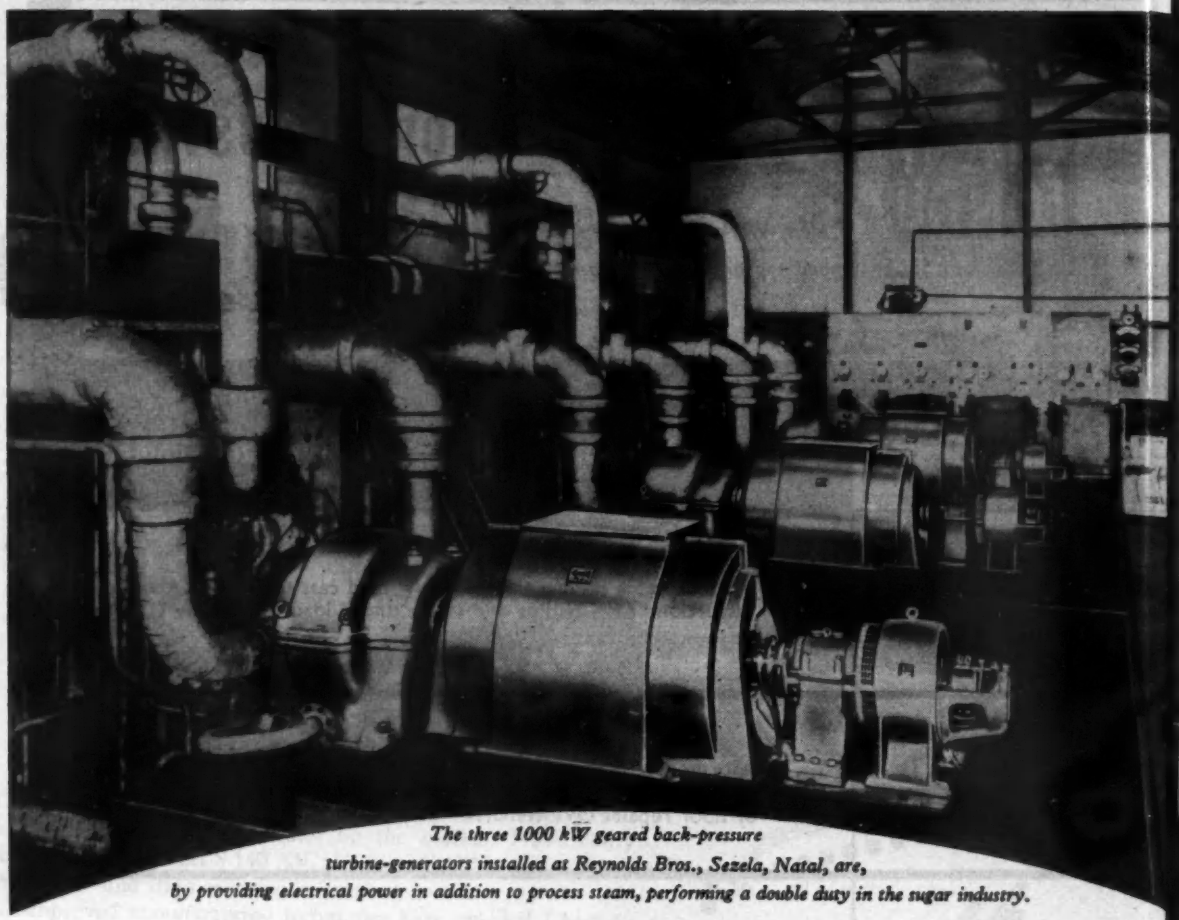
Geared Back-Pressure Turbines-



The three 1000 kW geared back-pressure turbine-generators installed at Reynolds Bros., Sezela, Natal, are, by providing electrical power in addition to process steam, performing a double duty in the sugar industry.

-cut your fuel costs

Great advantages can be gained by installing small back-pressure turbines for heating and process steam requirements in large factories. The back-pressure turbine is relatively cheap to install, occupies little space and requires only light foundations.

When Metropolitan-Vickers first installed one of their own back-pressure turbines at their Trafford Park Works in 1948 the cost of power and heating requirements for the factory were reduced by over £9,000 a year.

Please write for further details.

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An A.E.I. Company

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JOINT STRENGTH

more quickly and

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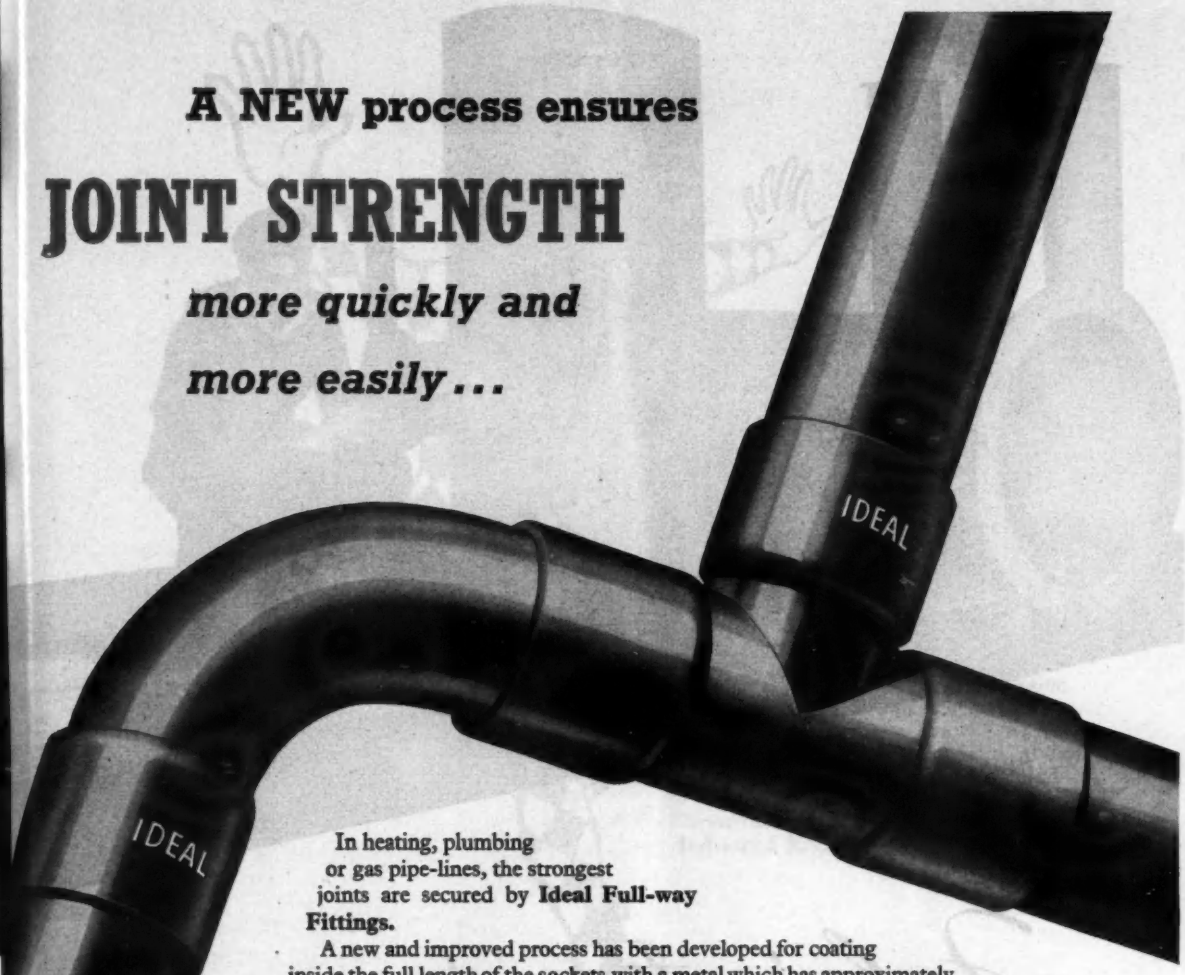

In heating, plumbing or gas pipe-lines, the strongest joints are secured by **Ideal Full-way Fittings.**

A new and improved process has been developed for coating inside the full length of the sockets with a metal which has approximately the same melting point as solder. This renders the securing of perfect joints a simple and speedy operation.

Ideal Full-way Fittings are ready for immediate use—no cleaning is necessary and no time is wasted by having to scour with steel wool on the inside to prepare them for solder.

The internal diameter of the Fitting is the same as that of the tube which seats flush against the shoulder of the Fitting, ensuring a uniform bore throughout and providing unrestricted flow.

Ideal Full-way Fittings are interchangeable and are manufactured for use with British light gauge copper tube. They are unaffected by extreme temperatures and the joints are actually stronger than the tube itself.

● *In order to test their efficiency under pressure, a number of Ideal Full-way Fittings of varying types and in ½", ¾", and 1" sizes were used to connect several lengths of copper tubing, the joints being soldered in the normal way. The completed assembly was then hydrostatically tested to a pressure of 2,000 lb. sq. in. without leakage or distortion.*

IDEAL

Full-way

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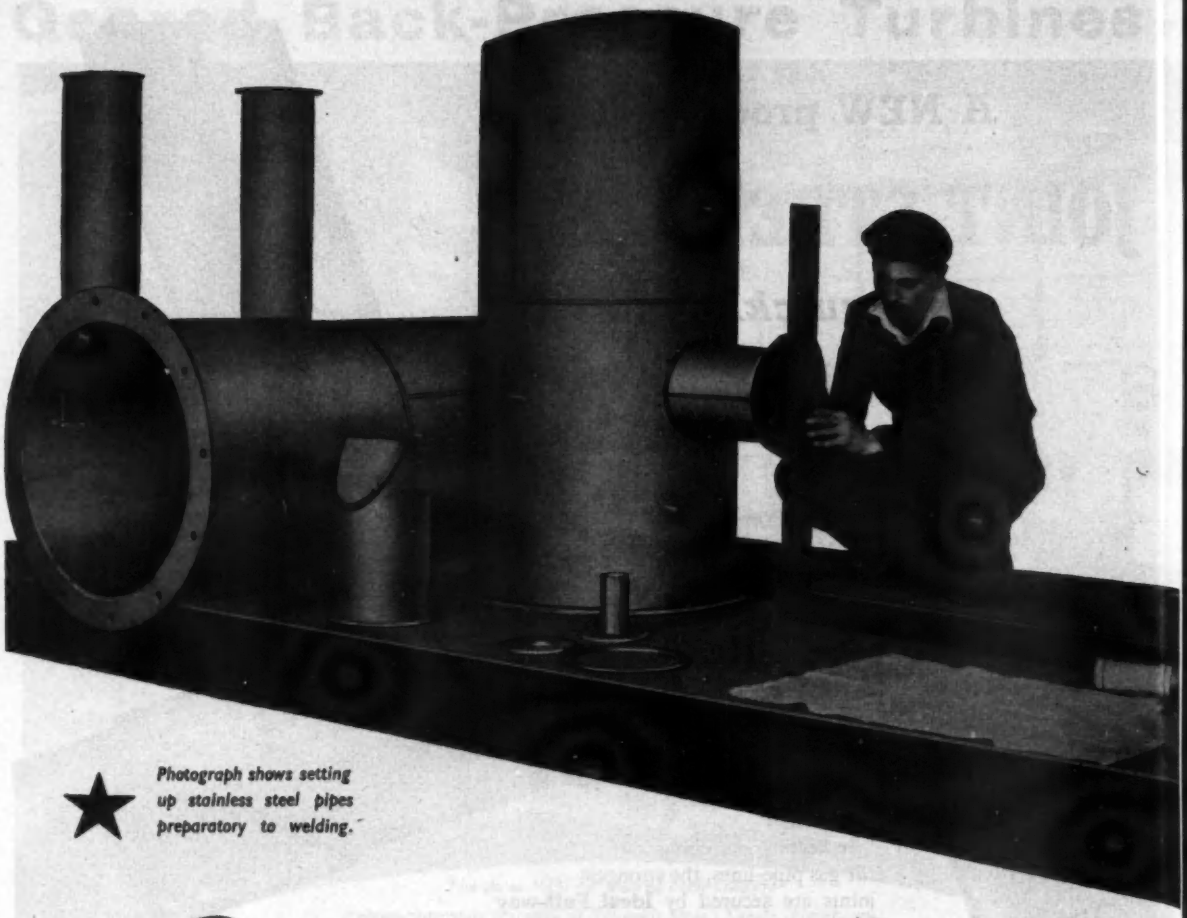
IDEAL - Standard

Manufactured by

IDEAL BOILERS & RADIATORS LIMITED · IDEAL WORKS · HULL

Visit our Stand No. 213, Row N, National Hall, Building Exhibition, Olympia, November 13th—27th.



Photograph shows setting up stainless steel pipes preparatory to welding.

Fabrication in STAINLESS STEEL

Widnes Constructional Department is manned by a staff of highly skilled desig ers and erectors, and is equipped for the production of Tanks for storage or mounting on road vehicles, High and Low Pressure Vessels, Adsorbers, Vertical Air Heater Shells, Crystallizers, Stills, Viscose Kettles, etc., in Stainless steel.

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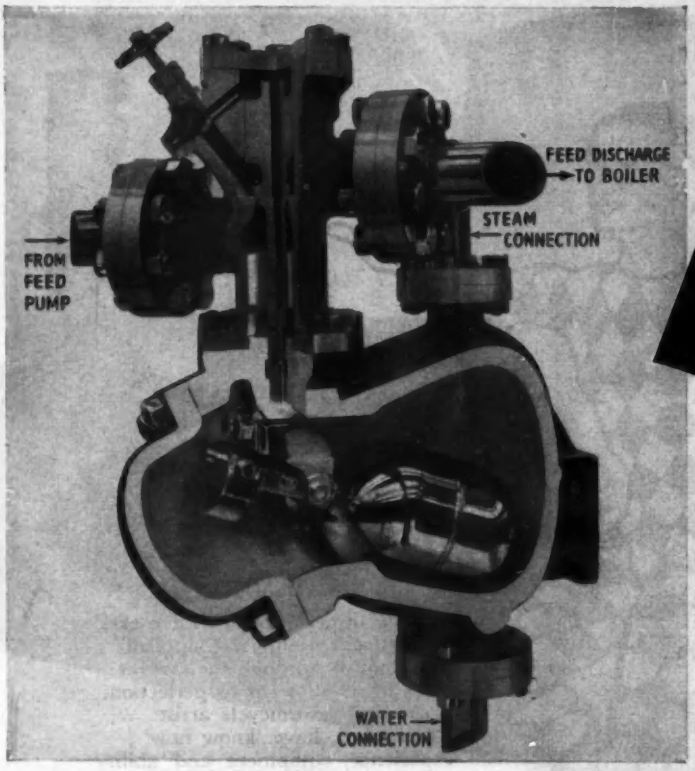

WEIR

"Robot"

FEED REGULATORS

NO SPRINGS - NO THERMOSTATS
NO DIAPHRAGMS

The "Robot" Feed Regulator is hydraulically operated by means of the discharge pressure of the boiler feed pump. Its operation is powerful and reliable and is not affected by excessive pressure difference across the regulator. It is entirely automatic and gives immediate response to small changes in the water level.

FEED PUMPS · FEED HEATERS
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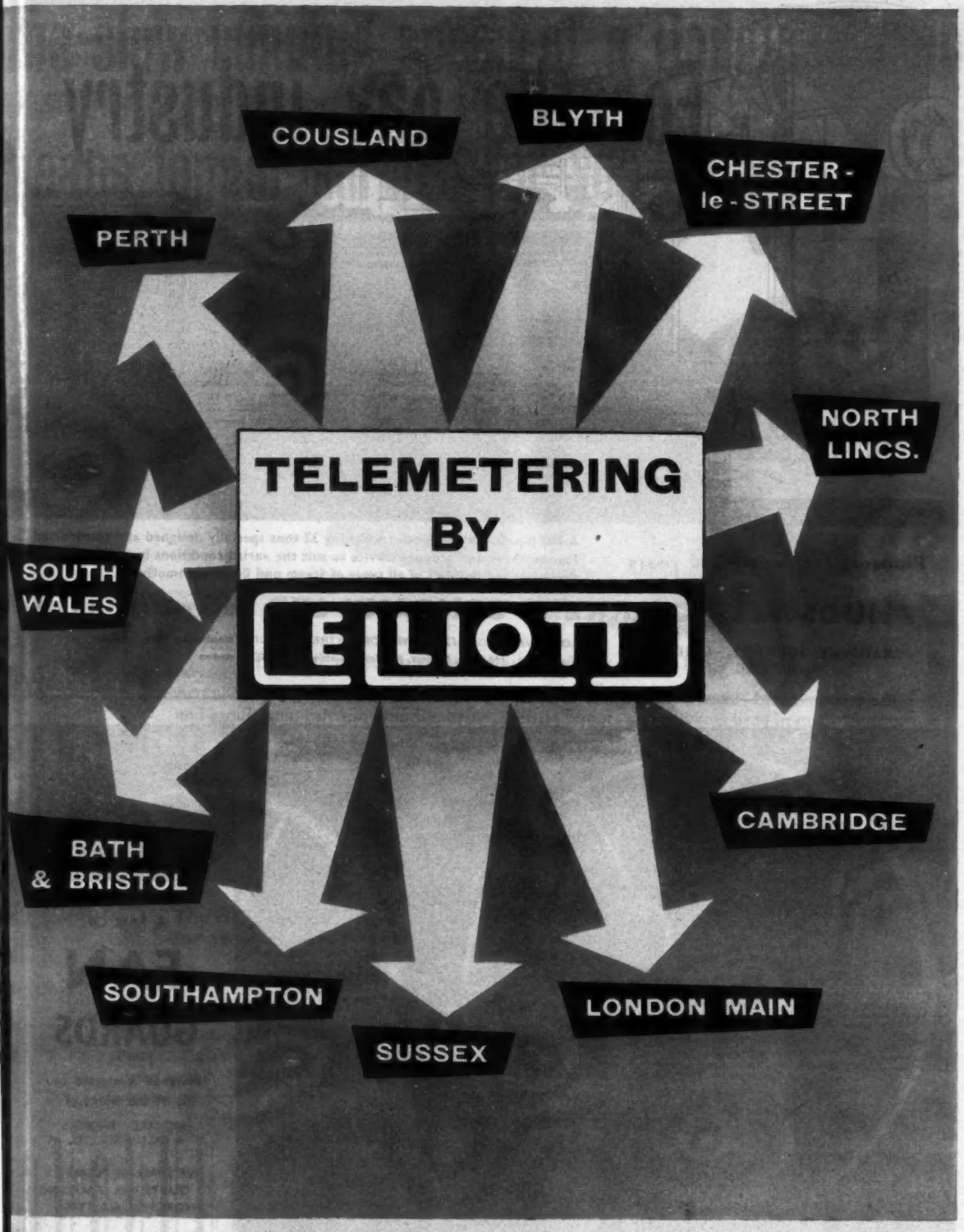

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A 200 h.p. Diesel Locomotive weighing 32 tons specially designed and constructed for the heavy and arduous service to suit the varied conditions in the Gas Industry. Designers and Builders of all types of Steam and Diesel Locomotives.

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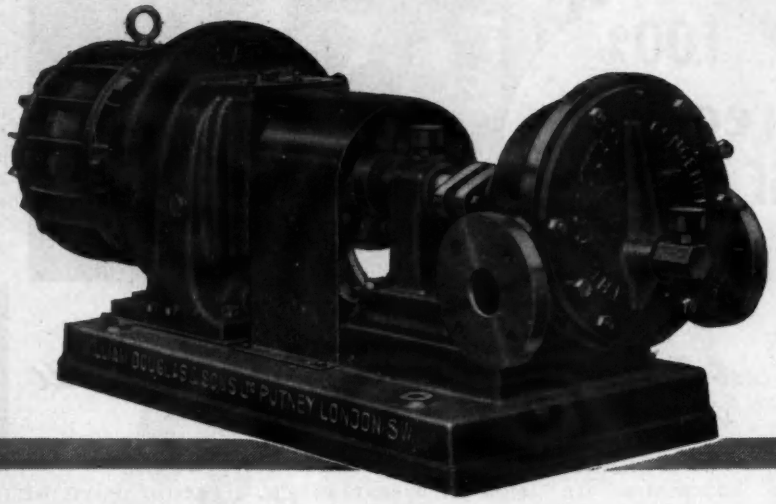
The slow running speed of a Douglas Pump means longer service for you–



This list of fluids shows the versatility of the Douglas Pump

Acetone; acids, alcohol; ammonia; beer and wort; benzine; benzol; bituminous paint and emulsions; calcium chloride brine; caustic liquors and solvents used in manufacture of artificial silk and soap solutions; cider; chocolate; cod liver oil; condensed milk; edible and inedible fats including cooking fats, dripping, lard, margarine emulsions and tallow; ether; fruit juices; gas works tar and ammoniacal liquors; glucose; honey; ice cream mix; ketone; linseed oil; lime; milk; molasses; nicotine; oils and lubricants of all types from light machine oil to automobile grease; oil of vitriol; paints and enamels, thick and thin; paraffin; petrol; resinous compounds; saccharine; silicate of soda; sugar solutions; trichlorethylene; tri-nitrotoluene; varnish and lacquers; vinegar; water; wine; white spirit; and all types of solvent used in dry cleaning.

The Douglas Pump is ideally suited to duties in Gas Works, and particularly for gas works tar and ammoniacal liquor.

There is nothing fussy or complicated about Douglas Pumps. The principle on which they operate is simple, giving running speeds as low as 10 r.p.m. whilst maintaining positive suction. Some idea of the wide range of liquors and semi-solids these pumps will handle is shown above. There are many Douglas Pumps at work today that have required only routine maintenance since their installation in the 1930's. All Douglas Pumps will give you this same rewarding service. Please write for our literature.

DOUGLAS **LONG SERVICE PUMPS**

WILLIAM DOUGLAS & SONS, LIMITED, DOUGLAS WHARF, LONDON, S.W.15. Telephone : PUTney 8181

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100% recovery of Benzole
HAS BEEN RECORDED

100% recovery of Benzole has been recorded in the Gas Industry where Sutcliffe Speakman plants of the type illustrated are already installed.

These recovery plants are the result of over twenty years' experience in the manufacture and industrial use of Active Carbon. Their capacities range from 250,000 cu. ft. per day. Entirely automatic and with few moving parts, they are compact, clean in operation, and economical to run. Their initial cost, too, compares favourably with that of other recovery systems.
In every way they are the most profitable investments. We are always ready to draw up a complete balance sheet for Benzole recovery in any specific undertaking of the Gas Industry.

to cut Benzole wastage to a minimum, consult

SUTCLIFFE SPEAKMAN

SUTCLIFFE SPEAKMAN AND COMPANY LIMITED,
Leigh, Lancashire. TEL : LEIGH 94. LONDON OFFICE : 2 CAXTON STREET, WESTMINSTER, S.W.I. TEL : ABBEY 308

Manvers Centralization Scheme :
From the top of the newly constructed Coal preparation plant: a small section of the immense network of railway sidings.

The supply and installation of these sidings and the adjoining trackwork for the new Coal Carbonization and Benzole Rectification Schemes were entrusted to the Eagre Construction Co. Ltd., by the National Coal Board. Over 9,000 tons of Iron and Steel were used in the construction of the forty miles of track and 230 turnouts and Special Point and Crossing layouts comprising the combined railway Sidings.
Eagre's skilful planning and practical experience in the day-to-day working of Colliery Sidings ensured that this vast scheme was laid efficiently to schedule, and without the slightest interruption of existing Colliery traffic.

Photograph by courtesy of National Coal Board

for a complete Track Service

Photograph by courtesy of National Coal Board

Work begins at Cadeby: **The National Coal Board again entrusts the Eagre Construction Co. Ltd. with a similar project. Earthworks, Drainage, Track Laying and ancillary works for thirteen miles of Sidings are now in progress at Cadeby Main.**

In addition to its activities in the Nation's Coalfields the Eagre Construction Co. Ltd. has worked continuously during the past ten years for British Railways, the Gas Board, the United Steel Companies, and has carried out large Power Station Projects for the Central Electricity Authority.

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EAGRE

Whatever the magnitude of your Siding requirements, be sure to consult
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INSTALL MASTERTHERMS for

The Mastertherm range consists of four finely designed overhead radiant gas heaters, each of which effects considerable saving in both money and valuable floor space. Costing little to install or operate, Mastertherm heaters give high radiant efficiency and ensure even distribution of heat over floor area.

As wall or suspension fittings they can be tilted at any angle from 30 to 75 degrees, distributing radiant heat —the healthiest known—downwards and outwards over an exceptionally wide area.
Although particularly suitable for lofty buildings where the maximum tilt is used, Mastertherms are equally efficient in buildings or rooms with lower ceiling heights—where minimum tilt is of course used. Mastertherm heaters are encased in attractive, vitreous enamel stone-coloured surrounds which blend with any colour scheme. Designed for use on low pressure town gas or liquid petroleum gases.

MASTERTHERM No. 1.
Heats up to 125-150 sq. ft. of space.

MASTERTHERM No. 2.
Heats up to 250-300 sq. ft. of space.

MASTERTHERM No. 3.
Heats up to 375-450 sq. ft. of space.

MIDGET
A double sided heater for small offices, corridors, cubicles—wherever a larger heater is unsuitable, (Heats 150 sq. ft.)

Send for full details and illustrated literature on the 'Mastertherm' range to:

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provide all the advantages of "Yorkshire" Fittings in Brass

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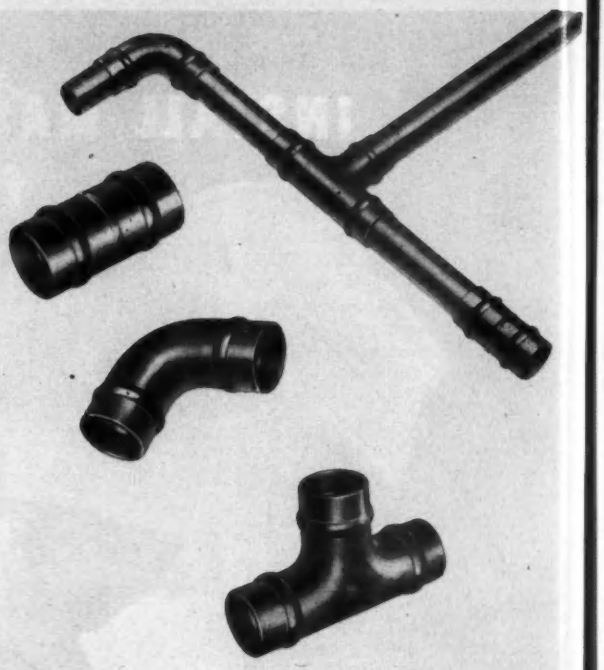

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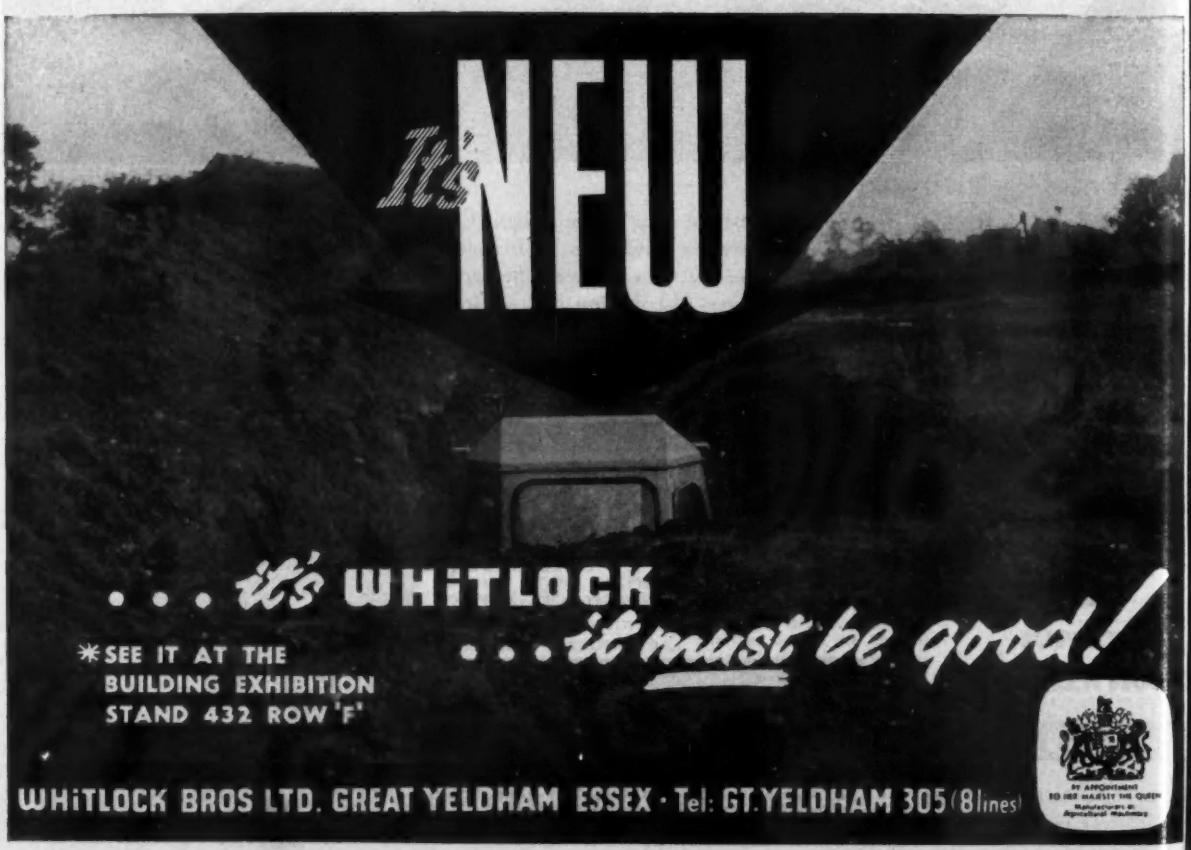
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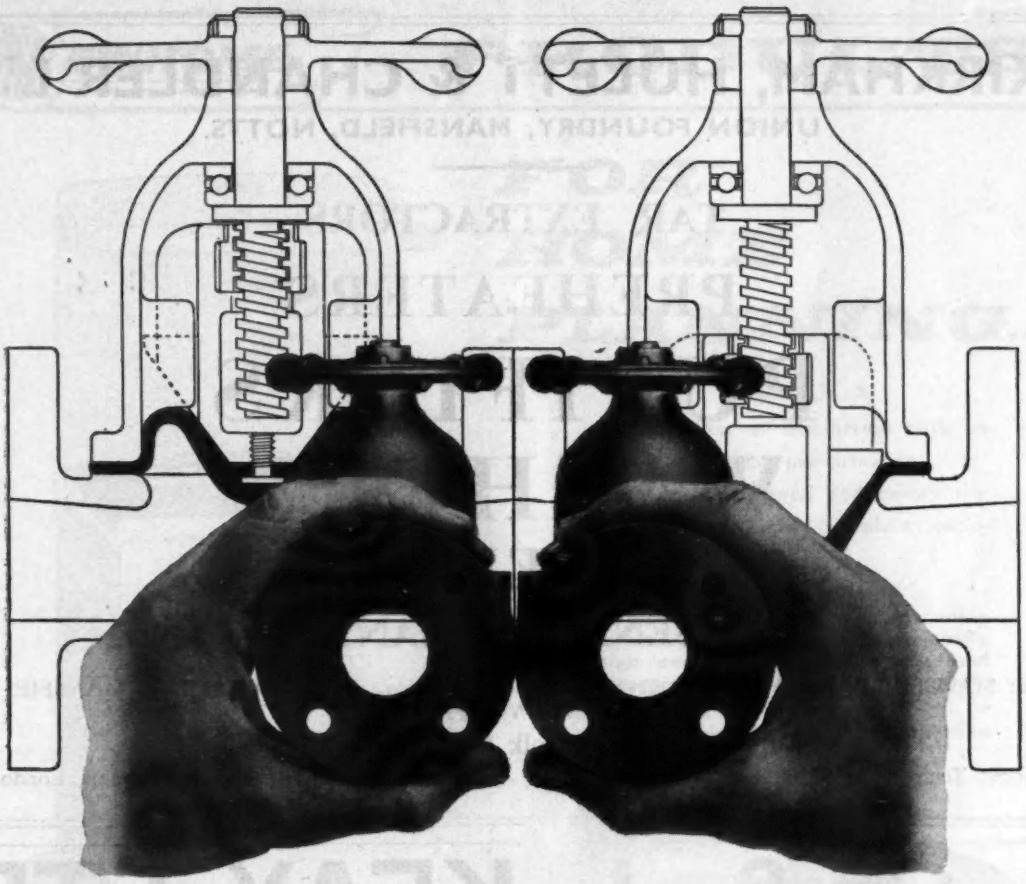

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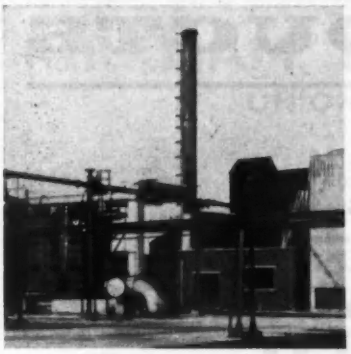

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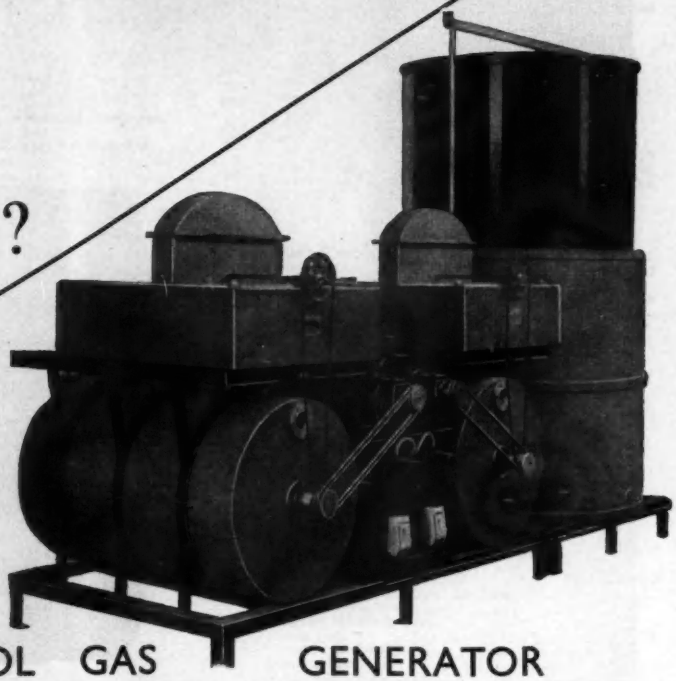

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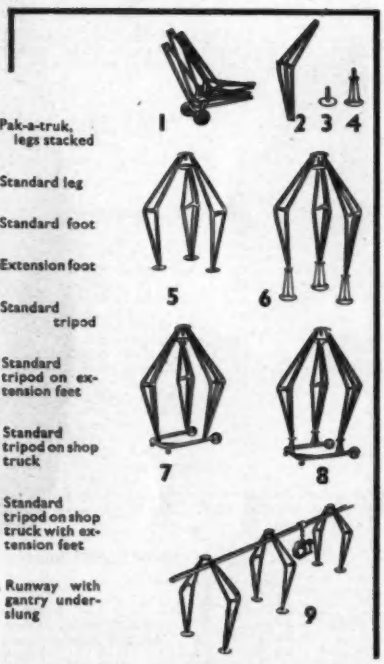

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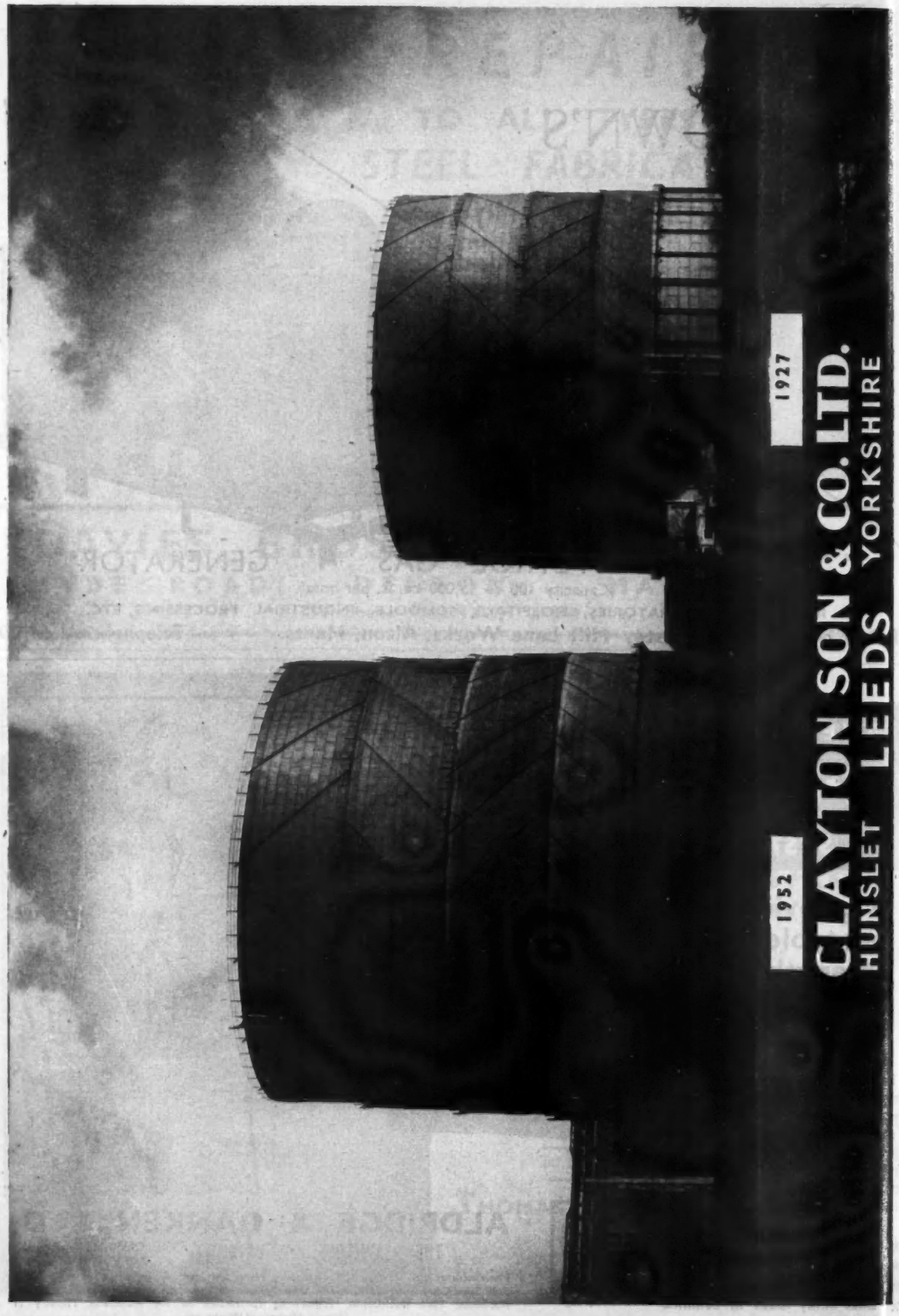
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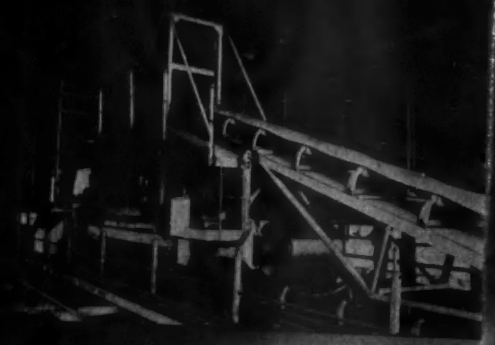

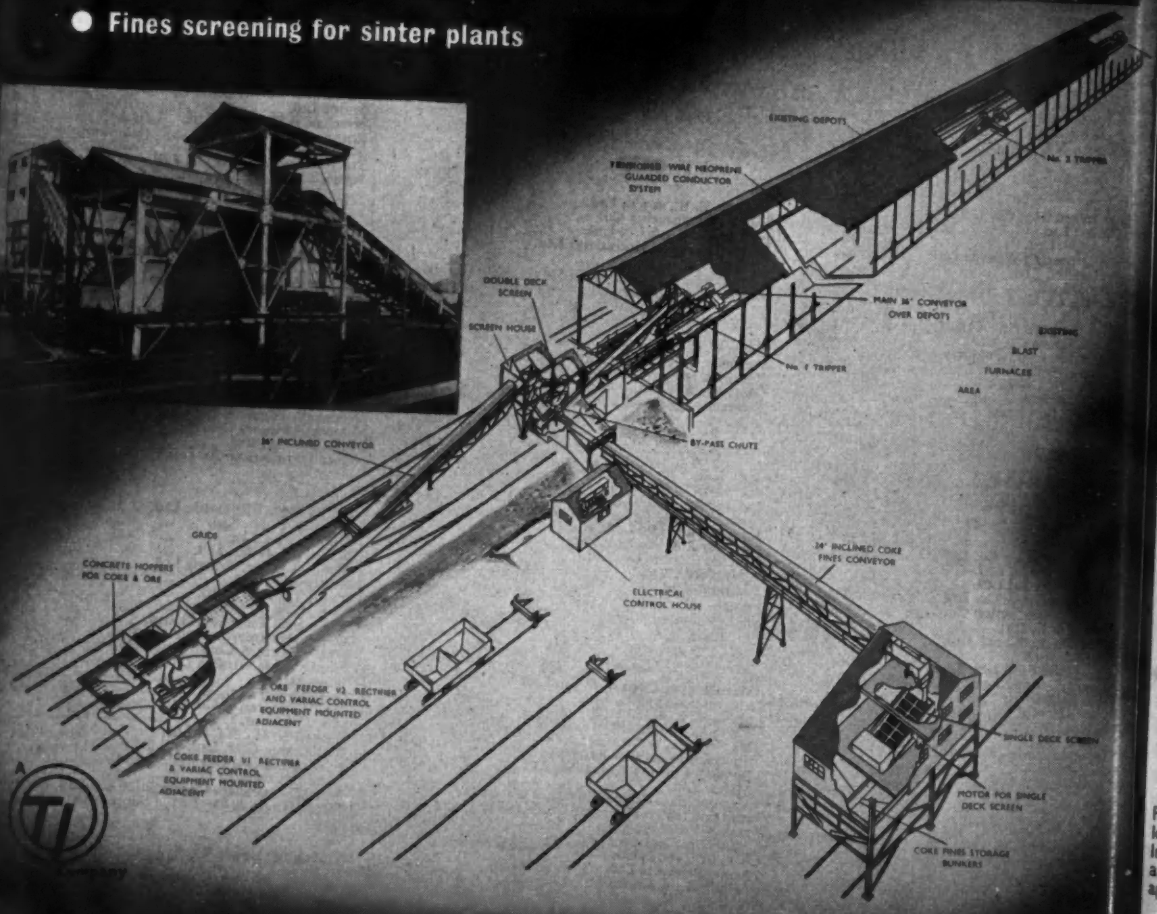
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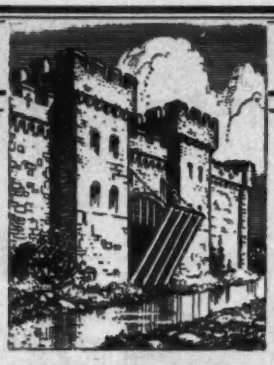

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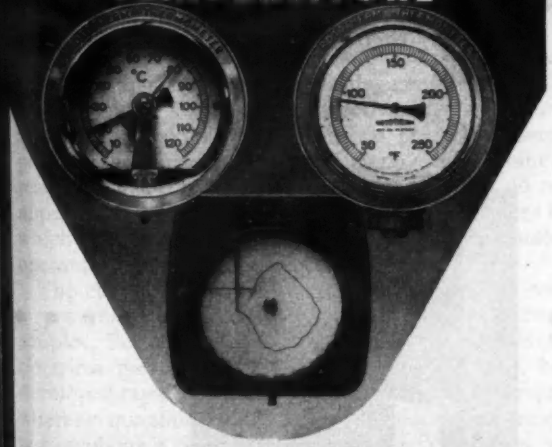

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Gas Journal

VOL. 292 NO. 4921 November 6, 1957

109TH YEAR

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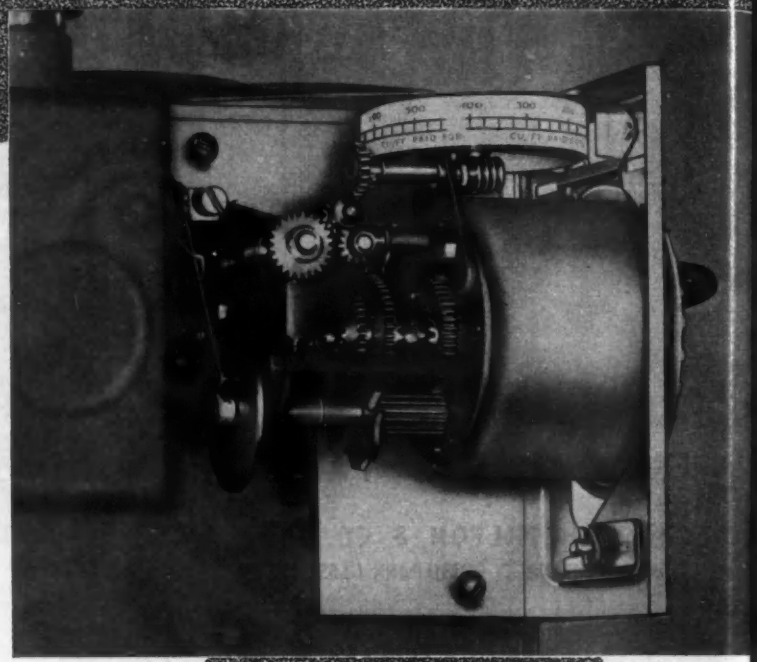
P/P mechanism with finger-tip control



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Gas Journal

VOLUME 292. No. 4921. NOVEMBER 6, 1957. 109th YEAR

Instrumentation in the Gas Industry

THE need for instrumentation in industry has undergone a profound change since before the war. At one time it was often only the modern power station which was reasonably well supplied with instruments mounted on a central panel which the shift engineer could refer to any moment to satisfy himself that everything was going as it should. The measurement of electrical quantities lends itself to a convenient form of easily readable indicator or recorder centrally grouped to bring information to a central point from which the operator or shift engineer may operate remotely controlled switchgear for correcting a deviation from previously determined conditions.

Such a state of affairs is more difficult in processes which at first sight are less easily controlled from a central point. The measurement of suction or pressure, the chemical composition of an end product or waste product, the rate of flow of raw materials to the point of reaction, or the level of storage and feed tanks do not appear at first sight to be easily measured by a means by which the value can be presented to a centrally situated operator or plant superintendent.

The electrical measurement of temperature has been a possibility for many years by means of thermocouples, but the measurement of other quantities by electrical means, though known before the war, has developed rapidly since; so have telemetering techniques whereby quantities measured by some physical means not involving a change in local electrical conditions can have the measuring apparatus placed very close to the point where the measurement has to be made, but the information may be continuously transmitted electrically over any convenient distance. This is made use of in the control of calorific value at a large works or in many distribution control rooms.

Such techniques allow a complete picture of the operating conditions to be continuously presented to the controller. The logical extension of this would be to have all means of altering the working conditions workable from the same central point, by means of motor operated valves, dampers, flopper gates, etc. As this may be done automatically by the measuring instruments themselves a high degree of automation of certain basic parameters is possible. Even so, the plant is only working under predetermined constant conditions for a certain quality and composition of raw material having the properties with which the operator is familiar.

In order that complete control of the quality and composition of the end product may be assured, samples for analysis must be taken. This generally involves transferring the sample to a laboratory some distance from the plant for analysis and means that there is a delay before an alteration in operational conditions influencing the quality can be made. Since the war techniques have been developed in certain industries by which analyses may be carried out in the plant stream itself which will inform the operator immediately of any change in quality. Such a change can be corrected far from the central control desk. An extension of such techniques might be the complete automation of the plant by which not only are the basic parameters kept constant, but they may be changed automatically as and when a change from the standard quality of the product demands it.

At a conference of the Society of Instrument Technology, held lately at Swansea, these topics were discussed and a number of papers presented by experts on various aspects of the problems facing the different industries interested in continuous measurement and how such measurements could be carried out. The conference was divided into several sections which dealt with certain aspects, such as gas stream analysis, measurement of physical properties, liquid stream analysis, and other subjects. We are publishing abstracts from the papers which are of most interest to the gas industry and these come under the heading of gas stream analysis.

Unfortunately, however, the manufacture of gas, except in oil gas and C.W.G. plants, does not lend itself to a great deal of automatic control. However com-

pletely the plant might be provided with instruments, it would at first sight seem difficult to effectively control a carbonising plant automatically. Ancillary plant, ammonia concentration plants, and effluent plants, being chemical plants with liquid or gaseous phase of operation, are more easily adaptable to automatic control, but the solid phase seems to be more difficult.

This did not prevent Mr. J. M. Brown, in his Presidential address to the East of Scotland Juniors, discussing automation and its application to the gas industry from accountancy to gas distribution and production. (An abstract was published last week.)

The need for some form of automatically operated carbonising plant seems fast becoming a necessity because of the difficulties of getting shift men to work in retort houses. Mr. Brown outlined the operations which he considers might be performed automatically but admitted that there are difficulties over the analysis of the incoming coal and of the resultant coke. The analysis of both these are necessary, however, if the plant is to be worked at the highest efficiency with different types of coal. As an ultimate goal he would like to see the retort house controlled by an electronic computor. The standards of performance would be fed into the machine on tapes and all deviations from the standard corrected in the working of the plant by the computor. That indeed is an ideal, but in the meantime perhaps we could have remote control regulated by very efficient technical staff. No longer would shift workers be necessary but merely highly technical shift supervision, and very highly skilled maintenance personnel. Perhaps the greater skill and responsibility needed would compensate for the discomfort of shift work.

The Pattern of Research

WITH the programme, though not yet the papers, of the forthcoming Autumn Research Meeting before us we may attempt a survey of what is actually going on in research and development in the gas industry, particularly on the production side. In spite of the present understandable emphasis on gas production from oil it must never be forgotten that coal, coal carbonisation and coal gasification by other methods are still the main preoccupation of the gas industry.

The Gas Council reports that work is still going on in the Lurgi process. It was understood, as far back as 1952, 'that the Lurgi process is ready for application in this country,' that 'only from experience on the full scale will a complete economic picture be obtained,' and that 'the erection of a full scale plant is being considered by the West Midlands Gas Board.' It is understood that at least one other area gas board has a similar proposal before it. It would appear that, most unfortunately, these projects are held up largely by restrictions on capital expenditure. The boards are still being urged to restrict their capital requirements 'even at the cost of deferring still further schemes which they consider essential to the full efficiency of their service' —an unfortunate position, indeed, especially in view of the vast sums which are to be expended by the electricity industry in the development of new methods of production.

Finally, it is regrettable that nothing, apparently, is to be reported to the Autumn Research Meeting on the details of the work mentioned in the Gas Council's annual report.

The third item in paragraph 99 of the report is the gasification of coal in a fluidised bed. On this subject again we have heard nothing authoritative since Dr. Dent's report (GC8) of 1953 when a very little advance on that of 1952 (GC1) was reported. Then we were told that success had been prevented by two inherent difficulties, one arising from the carry-over of dust, the other connected with the withdrawal of ash. It would be interesting to know whether the investigation and development of this technique are being pushed forward. We ask the question in view of the work which is going on in America and in France.

With regard to the latter attention should be drawn to a report we published . . . of a paper read before the International Congress of Industrial Chemistry. Here it was claimed that small scale experiments had shown success in the development of a dense-phase fluidisation process in which clinkers are disposed of pneumatically as soon as they have reached the adequate size and that the problem of carry-over is solved by re-circulation. It was announced that the research body of the French coal industry was erecting a full scale plant to test the validity of these conclusions.

Mr. Ernest West, in his William Young Memorial Lecture, called attention to the need 'to study again the well-known and established processes of carbonisation to ascertain if more economical methods can be applied thereto.' He mentioned the carrier-gas technique (the Rochdale process) in which he indicated a development in the direction of 'the introduction of hot gas into the continuous vertical retort—to effect distillation of the coal to a still greater extent by internal heating.' Such a process might go so far as 'dispensing with present methods of external heating.' The prospect is fascinating. It would eliminate at one blow all the difficulties with refractories in the construction of retorts. 'It is known that if 'contact heating' can be applied to the coal, comparatively low temperatures (around 600°C.) are sufficient to effect complete carbonisation.' And we are encouraged to think that Mr. West is himself doing further experimental work in this direction. In the meantime it is important to note that the North Western Board is producing, presumably with the aid of the carrier-gas technique, a solid smokeless fuel, to which they have given the name 'Phimax,' which is a complete success at a reasonable cost. Similar success has been achieved by the North Thames Board with their 'Cleanglow.' The Gas Council reports that 'The public demand for these new fuels already exceeds the present supply.'

Mr. West, with his incomparable experience in carbonisation, is also taking an active part in the development of complete gasification in the well-known form of a retort or retorts superimposed above a producer. Here again the North Western Board is in the lead with its plant at Wallasey. In this connection the paper to be presented at the Autumn Meeting on 'The Gaz Integrale Plant at Kensal Green' will be looked forward to with great interest. It represents work in collaboration between the North Thames Gas Board and the London Research Station of the Gas Council.

The possibilities of the complete gasification of coal in one or two processes, are by no means exhausted.

Gas alone is the complete answer to the Clean Air problem, eliminating both smoke and sulphur pollution of the air we breathe. And if, as we said in our editorial, 'Where do we go from here?', it is stressed, as it was by Dr. Bronowski again the other day, that coal should be developed, not only 'as a source of crude fuel, but as a raw material for refined fuels and chemical synthesis,' this latter development, it must be remembered, can only apply to its gaseous and liquid constituents which are best released as the by-products of carbonisation or some other form of gasification.'

Coal Demand

IT might seem strange to our continental neighbours that one of the reasons why coal rationing in Great Britain cannot be ended and why the National Coal Board should be faced with a continual yearly deficit is because the average householder and British Railways continue to demand a type of coal that is not only in short supply, but the production of which continues to fall year by year. To meet the demand for this particular type—large coal—quantities must be imported at a vast cost in valuable dollars from America.

It would seem to be more than a little paradoxical that so many rival voices should be advising the public to do the right thing—that is, to burn a smokeless fuel—and yet the N.C.B. are prepared to take so much trouble to procure for the public something which it knows in its heart of hearts the public should not have.

In a speech at a Coal Industry Society Luncheon, Lord Mills made it quite clear how serious and almost tragically comical the situation really is. He proposed charging the large coal consuming public the real economic price of the coal instead of an artificial price equal to that charged for home produced coal. This was not to make money, but to discourage the ordinary householder from buying large coal at all, and to encourage the use of the smaller sized coals.

Those big consumers of large coal, the railways, will sooner or later be reducing their demands in any case as electrification and the change to diesel locomotives takes place, but in the meantime, before these changes begin to have much effect, the only alternative fuel might be some form of briquette. If these could be made at an economic price, such a fuel might be found very satisfactory, especially when it is realised that a large briquette has been manufactured for a great many years in South Wales for export to the French railways and elsewhere overseas.

Such a course would not only relieve the pressure of demand on large coal supplies but would tend to use up the ever increasing quantities of fines that are produced year by year.

On the other hand, if the railway modernisation schemes go through as planned, there will be a steadily increasing quantity of large coal coming on to the market. Since there is a tendency for all modern steam raising plants to be fitted with chain grates or some form of mechanical stoking, and by means of these mechanical appliances the lower grades of coals can be burnt successfully and efficiently without having to resort to the large, high grade, steam coals, it is unlikely that a demand for large coal could be recreated if it once more became plentiful. It might have to be crushed and pulverised for processing.

The chief attraction in the burning of large coal in the domestic grate is that its ash content was about as low as it possibly could be. This was especially true before the use of mechanical coal cutters and power loading. In the smaller sizes, the coal contains varying quantities of ash which, even after cleaning, will be greater than coal from the centre of the seam. The grading too will tend to have its effect on the open grate fire, though waste from breakage in the coal cellar may, if anything, be slightly less than with large coal. It would appear, therefore, that to raise the price of the specially imported coal is about the only way to prevent its use, but unfortunately this may have serious political repercussions.

It is possibly fair to say that if the N.C.B. had been an ordinary commercial concern, it would not have hesitated to charge an economic price for its large coal, and a special price for that imported, but since the householder is such a big consumer of large coal, the price of coal generally has been raised to meet the N.C.B.'s deficits as they occurred. Political considerations, however, have almost certainly had an influence on the present means of bridging the gap. Any change might be extremely unpopular but, as Lord Mills pointed out, the value of coal imports from America at £25 mill. exactly equals the value of our exports in cars to the U.S.A. Thus all the efforts the country is making to increase American motor export markets are being absorbed in paying for an out-of-date whim. If only we realised it, we might still have our open fires by the more logical use of our own indigenous fuel resources.

SPUTNIK

IT makes us think, not now from the world-shaking viewpoint but from the narrow confines of a small publishing office. We think of our old 'GAS JOURNAL' going weekly in two's and even three's to the public libraries of cities in the U.S.S.R. of which we haven't even heard; we recall that, apart from all the Ping-hi's and Sung-lo's to whom we post in China, the main importer of technical literature in Peking has a weekly parcel of 41 'GAS JOURNALS'; Japan's gas and coke undertakings enjoy an almost saturated circulation; and Budapest has far more copies than the number of Hungarian undertakings.

Then we may be forgiven for pondering over the nationalised tendency to pare our home cheese. We think of the chief engineer of an area board who (anyway a few years ago) used to go each Thursday morning to the public library; otherwise he did not see the 'JOURNAL' until it filtered through to his desk the following Monday. We recall sympathetically the chief educational officer who posts his well-thumbed copy on to the most important college in the area, and the P.R.O. of another board whose copy of the 'JOURNAL' reporting his staff conference was pinched by another member of the H.Q. Department before he had read it. And there are not a few poor gas engineers who, because they are no longer on the 'production' horizontal bar, must dob-up the 65s. themselves.

Do not think, dear Reader, that our circulation is very far below what it was in those palmy days when every stoker at the Old Kent Road had his copy; but try with us to draw the moral.

Personal

MR. A. WEDGWOOD, O.B.E., has been appointed Staff Director of the Northern (Northumberland and Cumberland) Division of the National Coal Board. Mr. Wedgwood, who is at present Assistant Area General Manager of No. 2 (Mid-Northumberland) Area, Northern (N. and C.) Division, took up his appointment on November 1. He succeeds MR. J. V. WOOD, whose appointment as Director-General of Industrial Relations at national headquarters was announced in August.

DR. ALBERT PARKER, C.B.E., is to serve for five years on the World Health Organisation Expert Advisory Panel on Environmental Sanitation, and the Expert Committee on Air Pollution of which he will be attending a meeting in Geneva during the week beginning November 17.

MR. E. E. BAKER, District Engineer of the Southern Gas Board, has presented a pair of blankets to MR. J. HOLT at a recent ceremony to commemorate his retirement after 51 years in the gas industry.

MR. V. LAVER, a draughtsman in the Chief Engineer's department at Westminster of the North Thames Gas Board, is this year's winner of the Milne-Watson scholarship. The award entitles the holder to leave of absence with pay while taking a full-time course of study at a college, technical institute, or university. An accompanying grant covers fees, maintenance, and out-of-pocket expenses.

Mr. John Horsfall Dyde, Deputy Chairman of the Eastern Gas Board, who was awarded the O.B.E. in the Birthday Honours List, is seen outside Buckingham Palace after his investiture with his wife and elder son John who is a student at Guy's Hospital.

Mr. Laver, 19 years of age, has been with the Board for two years and has been attending evening classes at the South East Essex Technical College. He will now attend this college full time, and hopes to go on to a university.

MR. L. M. BROADWAY has been appointed Chairman of Edwin Cooper & Co., Ltd., 43, Grosvenor Street, W.1, a Company which is to market chemical additives manufactured by the Wakefield Group of Companies, headed by C. C. Wakefield & Co. Ltd. Mr. W. Helmore is to be Deputy Chairman; Mr. G. H. Thornley, Managing Director; while other executives will be Mr. W. F. List, Mr. G. E. T. Eyston, Mr. J. A. V. Watson, Mr. L. G. Packham, Mr. L. Colkett (also Secretary), Mr. J. C. Cragg, and Mr. C. R. Woodfield.

MR. W. C. MILLS, Middlesbrough's Public Lighting Inspector, was presented with a table light fashioned in the style of a street light on his recent retirement. Mr. Mills, who started as an office boy in the Middlesbrough Gas Department in 1917, took charge of street lighting in the borough in 1949.

THE VISCOUNT KNOLLYS, Chairman of Vickers, Ltd., has left London on a visit to South America. He will visit Venezuela, Colombia, Peru, Chile, Argentina, Uruguay and Brazil before he leaves for home on November 30.

MR. R. E. C. TREWHITT, who for 17 months has been Manager of the Cargo Fleet coke works, Middlesbrough, has obtained a similar appointment at the Irlam coke works of the Lancashire Steel Corporation, Manchester.

MR. ARTHUR WADDINGTON has been appointed an Executive Director of Universal Metal Products, Ltd. MR. E. G. WERTHEIMER is the Managing Director.

MR. A. MCG. CLARK, who was manager at Port Glasgow for 25 years, has retired after more than half a century in the gas industry.

Diary

November 7.—I.G.E. (NORTH OF ENGLAND SECTION): Newcastle-upon-Tyne. Paper by Mr. H. Buckley, 'As Others See Us.' 2.30 p.m.

November 8.—INSTITUTION OF MECHANICAL ENGINEERS: 1, Birdcage Walk, Westminster, S.W.1. General Meeting in conjunction with the British Nuclear Energy Conference. Paper, 'Vacuum Techniques in the Atomic Energy Industry,' by H. Kronberger.

November 8.—I.G.E. (MANCHESTER AND DISTRICT SECTION): Queens Hotel, Manchester. Autumn ordinary general meeting, 2 p.m.

November 8.—SOUTHERN G.C.C.: Special Meeting in the Conference Room, Civic Centre, Southampton. 11 a.m.

November 9.—EAST OF SCOTLAND JUNIORS: Perth. Paper by Mr. John H. Ramage, 'The History of Water Treatment.'

November 12.—WALES AND MONMOUTHSHIRE JUNIORS (S. WALES AREA): Llandarcy. Visit to B.P. Refinery.

November 12.—MIDLAND JUNIORS: Paper, 'The Fuel Expenditure Index,' by Mr. B. H. Cunningworth.

November 12.—INSTITUTION OF WATER ENGINEERS (MIDLAND SECTION): Paper on Cathodic Protection by J. S. Gerrard.

November 13.—INSTITUTE OF FUEL, NORTH-WESTERN SECTION: Engineers' Club, Albert Square, Manchester. 'Space Heating without Smoke.' Papers on gas, oil, electricity and solid fuels, followed by a discussion. One-day, joint conference with NATIONAL SMOKE ABATEMENT SOCIETY, N.W. DIVISION. 10.30 a.m.

November 13.—INCORPORATED PLANT ENGINEERS: Western: Grand Hotel, Bristol. 'Some Aspects of Flue Gas Corrosion,' P. F. Corbett. 7.15 p.m.

November 15.—JUNIOR INSTITUTION OF ENGINEERS: Pepys House, 14, Rochester Row, Westminster, S.W.1. Ordinary Meeting. Chairman's Address, 'Some Aspects of Town Gas Distribution,' by J. E. Gray. 7.0 p.m.

November 18.—WEST MIDLANDS G.C.C. Gas Offices, Edmund Street, Birmingham, 3. 2.30 p.m.

November 19.—SOUTH EASTERN G.C.C. EAST SURREY DIVISION. S.E. Gas Board premises, Katharine Street, Croydon. 2.45 p.m.

November 19 and 20.—INSTITUTION OF GAS ENGINEERS: Church House, Westminster, S.W.1. 23rd Autumn Research Meeting.

November 20.—INSTITUTE OF FUEL (MIDLAND SECTION): Imperial Hotel, Temple Street, Birmingham. Joint meeting with the West Midlands Division of the National Smoke Abatement Society. 6.15 p.m.

November 21.—MIDLAND JUNIORS: Visit to the G.E.C. Works, Witton, Birmingham.

Methane Project Inaugurated in North Staffs.

FIRST STAGE IN JOINT W.M.G.B. AND DIVISIONAL COAL BOARD SCHEME

METHANE extracted from Wolstanton colliery is now helping to save coal at the Etruria works of the West Midlands Gas Board where it is being mixed with gas made by conventional means to supply homes and industry in the Stoke-on-Trent district. This is the first stage of a joint scheme by which the Board will use methane from certain North Staffordshire collieries of the West Midlands Divisional Coal Board; by the middle of next year, when Holditch colliery has been included, it is expected to save about 1,000 tons of coal a week.

Provision exists for the extension of the scheme to other North Staffordshire collieries as circumstances permit. In time it is expected that the yield of methane from the North Staffordshire coalfield as a whole will be considerable.

Arrangements Flexible

In the first stage the intention is to give a minimum supply from the two collieries equivalent to 5 mill. cu.ft. a week of pure methane. As the calorific value of 100% methane is twice that of the same volume of gas made by carbonising coal, this will equal 10 mill. cu.ft. of coal gas. The arrangements are flexible to enable adjustments to be made at any time to meet the variations of supply to which a natural gas is subject.

Successful use of methane from collieries for this purpose has been made on a limited scale in other British coalfields but this is the first scheme in the Midlands. The scheme has been made possible by the development in post-war years of techniques for the systematic drainage of methane from collieries where it is present in appreciable quantities.

While the gas drawn off in this way has been applied in a number of cases to the heating of colliery boiler plants (some is still being used for this at Stafford) much of it has merely been discharged into the air on the surface.

The primary object of removing the gas from the pits is, of course, safety. Firedamp, largely methane with small proportions of higher hydro-carbons and other gases, is given off by most coal seams and by the strata above and below them when working takes place.

It was realised even before 1800 that it would be advantageous to extract methane from the strata in advance of, or during, the working of coal, instead of following the usual practice of carrying it away in the ventilation air-stream, but systematic drainage of methane has been successfully applied only recently. Today it is practiced to some extent at more than 40 collieries in Britain.

The Lord Mayor of Stoke-on-Trent, Councillor, the Reverend A. Perry, pulling the chain which opened the valve admitting methane into the gas supply. Watching the Lord Mayor are, left, the Mayor of Newcastle, Alderman W. E. Welsby, and the Chairman of Leek U.D.C., Mr. F. W. Shufflebotham, and on the right are Mr. G. le B. Diamond, Chairman of the West Midlands Gas Board and Mr. E. H. Browne, Chairman of the West Midlands Division of the National Coal Board.

Four methane drainage schemes have been, or are being, undertaken in North Staffordshire. The first began at Stafford colliery in 1950, and was developed in the high quality Bowling Alley seam. The gas, which is still being drained, has been used for firing boilers and in an experimental gas turbine for generating electricity. It will soon be augmented by supplies from Hem Heath colliery.

The other two schemes are at Wolstanton and Holditch. As these collieries are enlarged under the development plans for North Staffordshire, increasing quantities of gas may be available, though it is impossible to estimate the actual amounts.

Several Methods

Several methods of drainage have been developed for various conditions. Two are used in North Staffordshire—draining gas from the goaves of worked-out areas, and what is known as the cross-measure borehole method.

Draining from old goaves involves the erection, at the entrances to the worked-out districts, of controlled pressure chambers, through which the methane is drawn in pipes at rates appropriate to the production of methane and variations in barometric pressure. The cross-measure borehole method consists of boring holes 2 in. to 3 in. diameter and up to 300 ft. long at an angle upwards sometimes behind and sometimes in front of the working coal-face and sometimes downwards from the roadways leading to the coal-face.

These boreholes and also the pipes leading from the controlled pressure chambers are connected to a range of pipes which carry the gas to the pit-bottom and thence up the shaft to the surface. The flow of gas is helped, when necessary, by suction pumps.

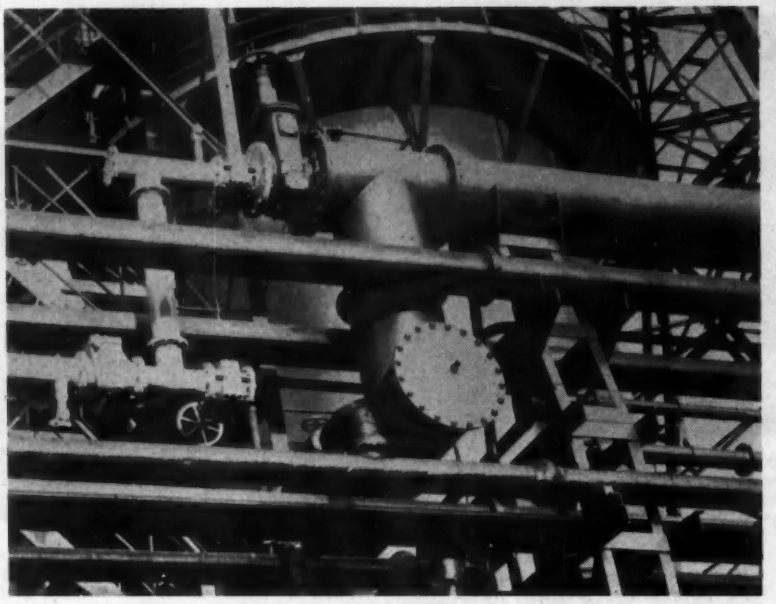
Variations in the volume of methane available occur, rather as in oil drilling, through changes in natural conditions. The yield, either from controlled pressure stoppings or from a particular borehole, cannot be accurately estimated in quantity or duration, but if enough sources of supply are producing gas simultaneously, a reasonably constant total can be maintained.

It is not yet possible to give a reliable indication of the potentialities of methane drainage in the coalfield as a whole, but the quantity of methane drained may ultimately be considerable.

The quality of the gas drained by the boreholes and from the old workings varies within a normal range of between 55% and 95% methane, but for convenience of calculation all figures have been converted to and are used in terms of pure (100%) methane. In terms of coal equivalent the minimum 5 mill. cu.ft. to be supplied to the Gas Board will, on the basis of calorific values, represent a saving of 700 tons a week.

Different Uses

Where demand for town's gas is high —as in the Potteries—and where circumstances make it possible to supply methane from the collieries to the local gas board, this form of utilisation may be the best. In other cases it may more advantageously be used for firing colliery boilers, though this will have a decreasing application with the electrification of colliery plant and for pit-head generation of electricity or compressed air by gas turbine. There is an experimental installation, originally sponsored by the Ministry of Power, at Stafford Colliery.



Photograph shows methane gas main connection with coal gas main, for mixing the two gases.

Methane can also be compressed into bottles for use by road vehicles and for other purposes; and it may possibly be used by the chemical industry.

The availability of methane from collieries into the North Staffordshire area is particularly fortunate, because all the gas can readily be used to meet the rapidly growing needs of both the industrialist and the the householder.

There has been a striking change from solid fuel to town gas within the pottery industry, but a vast potential demand for gas still remains, not only for the actual firing of the ware, but for ancillary processes such as clay drying, frit firing, colouring, etc. This demand will be accentuated as manufacturers implement clean air requirements.

In 1939 the amount of gas used by the pottery industry was 1,341 mill. cu.ft. In the year ended March 31 last it had risen to 6,422 mill. cu.ft.—an increase of 5,081 mill. cu.ft. This resulted in a big reduction in the amount of raw coal consumed by the pottery industry but a big increase in the amount of coal required by the gas industry.

Greater Efficiency

The estimated increase between 1939 and the year ended March, 1957, is of the order of 250,000 tons. The important point, however, is that not only was the extra gas required by the pottery industry produced from the raw coal but some 125,000 tons of coke and other valuable by-products were also obtained. This is a clear example of greater efficiency in the use of natural resources.

There are now nearly 330 gas-fired kilns in use in Stoke-on-Trent and 112 factories use gas for their firing processes. Even so, there are still many factories using raw coal which will have to be converted, thus throwing a further heavy demand on gas supplies in North Staffordshire. This applies particularly in the case of the smaller factories, and to help them make the change the West Midlands Gas Board has developed highly efficient small kilns which need comparatively little space. In a few years' time the use of raw coal in the pottery industry may well be virtually eliminated.

Large Consumer

It is perhaps not generally realised that one large pottery works consumes as much gas as the towns of Congleton and Leek together. Valuable though the methane mine gas is to the Gas Board, it is at present sufficient only to supply one large factory.

Although the calorific value of pure methane is 1,000 B.Th.U. per cu.ft., the gas drained from Wolstanton colliery and piped into Etruria works has shown a calorific value of about 700 B.Th.U. The declared value in Stoke-on-Trent for town gas is 470 B.Th.U.

It is necessary either to mix the methane with gas of slightly lower calorific value manufactured at the gasworks or to lower its thermal value by catalytic 'cracking' in a reforming plant. Because of the proximity of Wolstanton colliery to Etruria works, the first of these processes has been adopted.

The methane piped to Etruria is mixed with the coal gas stream so that its calorific value can be adjusted to the statutory level of 470 B.Th.U. without resorting to a reforming plant. By this means, the heavy capital cost of reforming plant is avoided, and the full thermal value of the methane gas is retained.

It is only when large units of gas-making plant are conveniently situated near to the colliery from which the methane is being drained that such a procedure is economically feasible, as the methane represents a relatively small percentage of the total gas distributed. There is, of course, a limit to the volume of methane which can be absorbed in this way, but the total from both Wolstanton and Holditch collieries will not exceed this limit.

The methane gas is metered at the colliery and passed to Etruria works, where it is fed into the production gas stream either before or after purification. The transmission main is also capable of carrying the methane from Holditch colliery when it becomes available.

Future Plans

The future depends very largely on the extent of the natural resources. With this important qualification, the West Midlands Divisional Coal Board intend, as part of their general plan for developing the North Staffordshire coalfield, to drain methane from Chatterley-Whitfield as well as the four collieries already mentioned. They will collaborate closely with the West Midlands Gas Board in the fulfilment of this intention.

Fridges for Hire

Bangor (Co. Down) Borough Council has approved a scheme for the hiring out of gas refrigerators at 3s. a week, a canvass of the Council's housing estate at Ballymaconnell having shown that there was a demand.

Sc.G.B. Closes Cambuslang

THE Scottish Gas Board have ceased production at Cambuslang gasworks as part of their integration plan for the Lanarkshire area. Gas supplies at the rate of 3 mill. cu.ft. a week are being drawn from the Uddingston works.

The closure affects 25 men; all have been transferred to new jobs at Uddingston, Hamilton, and Motherwell works.

The system of continuous vertical retorts which was in use at Cambuslang was installed in 1913.

North American Developments

THE Alberta Gas Trunk Line Company are to build and operate an extensive gathering system for Alberta and the Southern Gas Company's proposed 1,300-mile Alberta to California natural gas pipeline, subject to approval by the Alberta and Canadian Governments.

Alberta Gas Trunk was incorporated in 1954 to construct gathering lines within Alberta for local consumption and for export to other parts of Canada via Transcanada Pipe Lines from Alberta to Eastern Canada.

Mid-Western Industrial Gas, of Edmonton, has signed a new agreement with Calgary Power to speed up gas supply to meet the needs of the second unit of the Wabamun steam plant which is expected to go into operation next autumn.

SIR HAROLD SMITH AT COUSLAND

'First Practical Result of our Search for Natural Gas'

NATURAL gas from a 1,600-ft. deep well at Cousland, near Dalkeith, is now flowing mixed with coal gas in the public supply of Musselburgh, Tranent, Cockenzie, Port Seton, and Prestonpans. When Sir Harold Smith, Chairman of the Gas Council, officially opened the well-head valve last week he said:

'To you this may be simply the turning on of a valve, but to me it is the first practical result of our programme of search for natural gas. We have been rather disappointed in other parts of the country where we had every reason to believe from surveys that we should have been much more successful.

'We must comfort ourselves with the knowledge that they were searching for natural gas for 25 years in Northern Italy before they found it.' He congratulated the Scottish Gas Board on their initiative in making use of the natural gas.

Mr. Sydney Smith, Chairman of the Scottish Gas Board, said the purpose of the present venture was to find how much gas was in the well and if it would be advisable to sink another. Later he said estimates had put the quantity of natural gas in the reserve at between 250 mill. and 2,500 mill. cu.ft.—at the present rate of consumption, enough to last between seven and 70 years.

Underground Storage ?

Sir Harold hinted that when the gas is exhausted the Scottish Gas Board may reverse the process, pump gas back into the well, and use it as underground storage. An engineer engaged on the project said the idea would probably be to pump gas into the ground in the summer months and store it for use at peak periods in winter.

Drilling the well has cost the Gas Council some £30,000, and the Scottish Gas Board have invested another £25,000 in the plant and pipeline which connects Cousland with Musselburgh works. The principal technical problem is the reduction of pressure. Gas comes from the well at about 620 lb. per sq. in. It has to be reduced in three stages by pressure regulating valves to 3 lb. per sq. in., at which it enters the main conveying it to Musselburgh. The proportion of the public supply is now 90% coal gas and 10% natural gas. Natural gas is non-toxic and as it does not have the characteristic smell of coal gas, the odorising agent, tetrahydrothiophene (T.H.T.), is added.

After the opening ceremony a reception was given by Provost J. Lannan, Musselburgh, to members of the Scottish Gas Board staff and other guests in the town chambers preparatory to a visit to the Musselburgh works.

Later a luncheon was held in the Caledonian Hotel, Edinburgh. Proposing the toast of the 'Gas Industry,' the Earl of Balfour, Chairman and Managing Director of Bruntons, Ltd., Musselburgh, and Member of the Scottish Division of the National Coal Board, recalled that before the war his company had considered using the Cousland natural gas but had decided the risk was too great for a small company.

Sir Harold Smith opens the well-head valve.

The country was facing a serious fuel shortage he continued. The gas industry could play a vital part in bridging the gap.

The Scottish Gas Board was making considerable strides: Efficiency had been increased; the building of a Lurgi plant in Fife to use lower ranking coals was under consideration; natural gas was in use; and negotiations for taking methane drainage and coke oven gas were well advanced, as were negotiations with Grangemouth oil refineries for the use of their residual products.

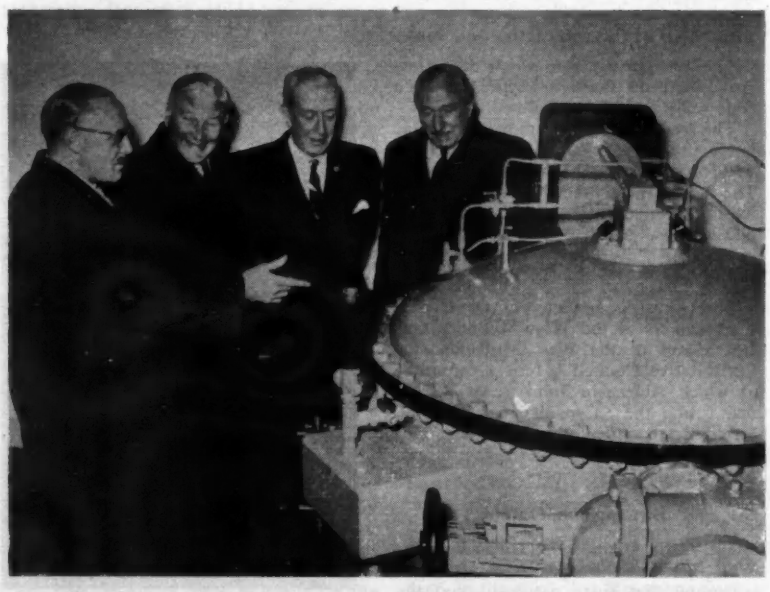
Lord Balfour made an appeal for more research by the Scottish fuel industries into the utilisation of peat. He did not underestimate drying and transporting problems, but felt peat was a fuel Scotland could not afford to neglect.

Problem of Costs

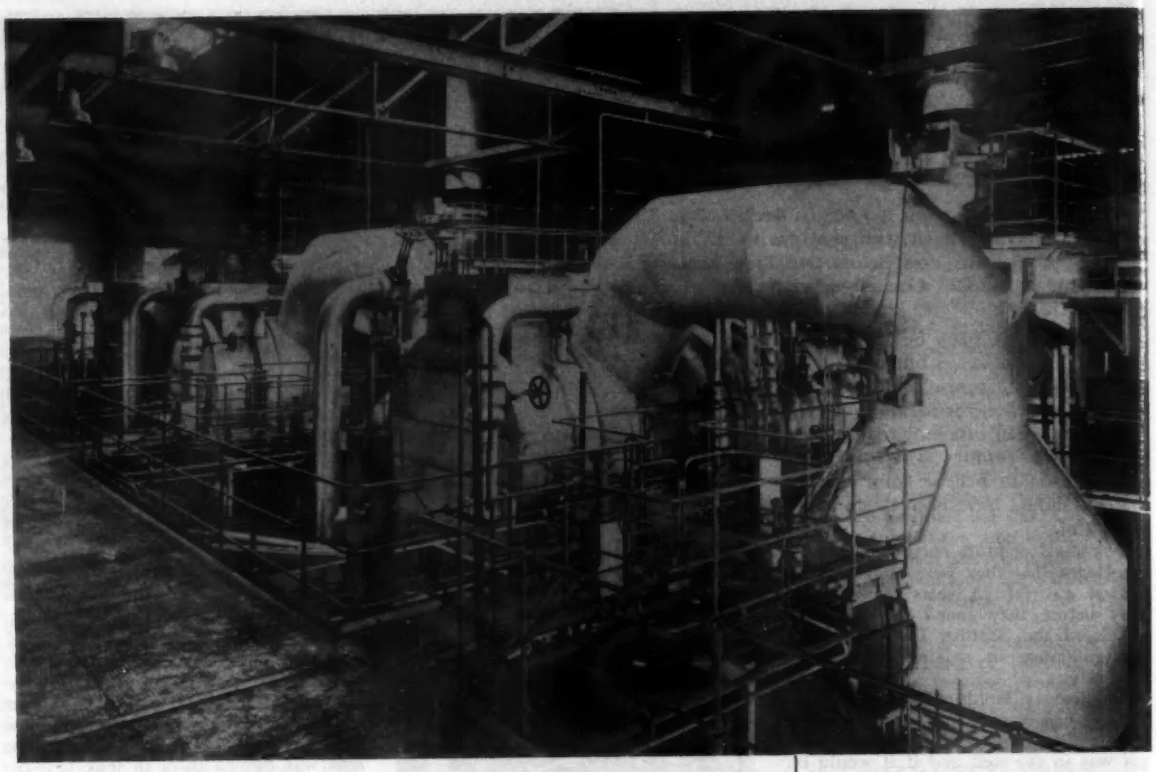
Replying, Sir Harold said the efficiency of the gas industry had been greatly improved during the past five years. The biggest problem was that of costs over which they had no control, while the growing shortage of good carbonising coal was forcing them to look to other ways of producing gas.

Proposing 'Our Guests,' Mr. Sydney Smith said the use of natural gas from Cousland was a sign of the practical imagination shown by the Gas Council in initiating the search for natural gas, and of the imaginative spirit which animated the gas industry.

Mr. J. M. Caldwell, Managing Director of Scottish Oils, replied on behalf of the guests.



Inspecting the metering equipment at Musselburgh gasworks are, left to right, Mr. Sydney Smith, Chairman, Scottish Gas Board; the Earl of Balfour, Chairman, Bruntons, Ltd., Musselburgh; Provost James Lannan of Musselburgh; and Sir Harold Smith, Chairman, Gas Council.



General view of the three water gas machines from the centralised control and operating room. In the foreground can be seen the high pressure oil hydraulic connections. To the right is seen the top of the superheater and the blow gas connection to the waste heat boiler.

WORKS PRODUCTION JUMPS 25%

But Nechells C.W.G. Plant Needs Only Four Operators

A NEW carburetted water gas plant inaugurated at the Nechells works, Birmingham, needs only four men to operate it, yet it will raise the output of the works by 25%. One man will be in charge of the automatic operators in a room at the top of the new building.

The automatic plant, which needs less space than the traditional type, has taken four years to build and instal.

The water gas will be piped to storage holders at Washwood Heath, where it will be mixed with ordinary coal-gas. The new plant is practically self-supporting in steam generated by the waste gases and can also generate its own electricity.

Largest in Provinces

The plant was inspected on October 23 by Members of the West Midlands Gas Board and of the West Midlands Gas Consultative Council before a ceremony at which Alderman John Lewis, Chairman of the Consultative Council, unveiled a commemorative plaque. This installation makes Nechells the largest gasworks in the provinces.

Birmingham Output

Mr. G. le Diamond, Chairman of the West Midlands Board, said after the ceremony that since nationalisation the increase in gas output in the Birmingham Division amounted to 22%. Peak production capacity had been increased by 36% of which the new plant would account for 15%.

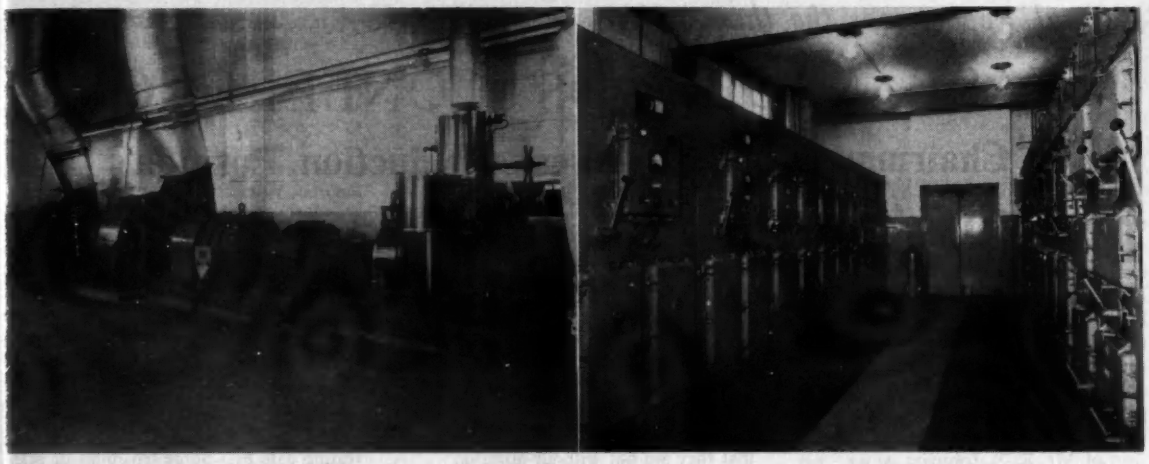
Alderman John Lewis, Chairman of the W.M.G.C.C., unveiling the commemorative plaque.

Commemorative Plaque Unveiled

The new C.W.G. plant consists of three gas-making machines manufactured by Humphreys & Glasgow Ltd., with a total capacity of 16.5 mill. cu.ft. per day. It is complete with all ancillaries and a deep box purifier plant. The new installation brings the total capacity of Nechells gasworks up to 51.5 mill. cu.ft. per day.

Completely Automatic

The gas-making plant is completely automatic and is controlled by oil hydraulic equipment worked by the standard automatic operator. The control equipment is all brought together in a centralised control room at the top of the building, from which the attendants have a good view of the plant and can easily get to any part of it in case of emergency. The plant is fully instrumented and these are also to be found in the control room. Each gas-making



Left: *The steam turbo-electric blower. The running speed of the motor is 1,475 r.p.m., but above 1,532 r.p.m. it becomes a generator.* **Right:** *A view of the plant's electrical substation, showing the special gasworks type switch gear.*

machine is capable of working independently and has its own control equipment which is duplicated for the other machines.

Each machine is fitted with a fire depth indicator by which the attendant knows the state of affairs in the generator. This controls the size of the charge. The generators are self-clinkering and ash removal is accomplished by two belt-conveyors arranged diametrically opposite each other at the clinker outlets of each generator. These feed onto a main belt by which the clinker is taken outside the building for dumping.

The carburettors are specially designed for using heavy oil should it become economical to use this form of enrichment. Two-stage gas cooling has been adopted. Primary cooling is by direct contact scrubbers with a circulating water system, followed by hot gas detarrers and water tube condensers from which the gas passes to a relief holder of 200,000 cu.ft. capacity. From here the gas passes by way of electrically-driven Connersville exhausters and a static naphthalene washer to the box purifiers, finally to be boosted by Connersville compressors to 10 lb. per sq. in. The capacity of exhauster and booster plant is 250,000 cu.ft. per hour.

To supply blast to the generators, three Keith Blackman fans have been installed, two of which are electrically-driven; one is both steam-turbo and electrically-driven on the same shaft.

Standby Blower

Since any two of the gas-making sets are worked out of step, one blower can operate two sets, so that when three machines are in use, there is always a stand-by blower. The combined steam turbo and electric blower is particularly interesting. Here two things have been accomplished. All steam from two of the waste-heat boilers, a maximum of 16,000 lb. per hour at 160 lb. per sq. in. at 500°F, can be expanded and passed out by the turbine at 9 lb. per sq .in into a low pressure main for process work. In doing so, sufficient power has been recovered to supply the blast for two machines and generate 40% of the electrical needs of the plant.

400 H.P. Motor

This is accomplished by using the 400 H.P. motor (the other fans are driven by 275 H.P. motors) alternately as a motor and an ansynchronous generator, depending on what speed the turbine is working, and making use of the grid mains for the exciter field. Steam from the annular boilers of the water gas generators at 40 lb. per sq. in. passes through pressure reduction valves to the low pressure steam system.

The plant is equipped with its own electric substation into which two alternative supplies of electric power are fed. The switch gear, which is of the special gasworks type, has been specially designed by Donovan Electrical Co., Ltd., in conjunction with the West Midlands Gas Board.

Oxford's First Smoke Control Area Confirmed

NEWS that Oxford had received confirmation of its first smoke control area from the Minister of Housing and Local Government was given recently when the Southern Gas Board, in conjunction with the City of Oxford Health Department, convened a smoke prevention meeting at Oxford Town Hall recently.

Dr. J. F. Warin, Oxford's Medical Officer of Health, was in the Chair, and the speakers were Mr. W. Combey, Chief Public Health Inspector, City of Oxford; and Miss Lovell Burgess, Lectures Officer, The Gas Council.

Alderman Mrs. I. D. Harrison-Hall, Chairman of the Oxford City Council Health Committee, presided at the open forum which followed the meeting; and those on the panel, in addition to the speakers, included Mr. D. Murray, Deputy City Architect and Planning Officer; Mr. B. Stonham, Deputy Area Engineer, National Industrial Fuel Efficiency Service; and Mr. F. W. Freeth, Area Coke Officer, Southern Gas Board.

Mr. H. G. Broadbridge, Regional Sales and Service Manager, Southern Gas Board, thanked Dr. Warin, Alderman Mrs. Harrison-Hall, and the speakers and panellists.

B.R.T.A. DINNER

£60 mill. a Year to be Spent on Road-making

THE Government intends to spend about £60 mill. a year on road-making 'in the not very distant future.' Mr. G. R. H. Nugent, Joint Parliamentary Secretary, Ministry of Transport and Civil Aviation, made this statement when he was principal guest at the British Road Tar Association's annual dinner at Dorchester House, London.

Mr. Nugent said an expenditure of £26 mill. was proposed for this year, and £66 mill. of work was committed.

'We are going to call upon you to build a great length of road over the next few years and I realise that these new motorways as they are built are going to create a very favourable impression.' Nobody had built roads of these dimensions since the Romans.

Mr. Nugent was replying to the toast of the guests, proposed by Mr. D. D. Burns, O.B.E., a Vice-President of the Association and Deputy Chairman of Scottish Gas Board.

Mr. Leslie O'Connor, C.B.E., made what he called his 'swan-song' as President of the Association—a response to the proposition of The Association by Sir Frederick Scopes, Chairman of the British Coking Industry Association and President of the Coal Tar Research Association. Dr. A. Schmitt, Chairman of the International Road Tar Conference, also spoke.

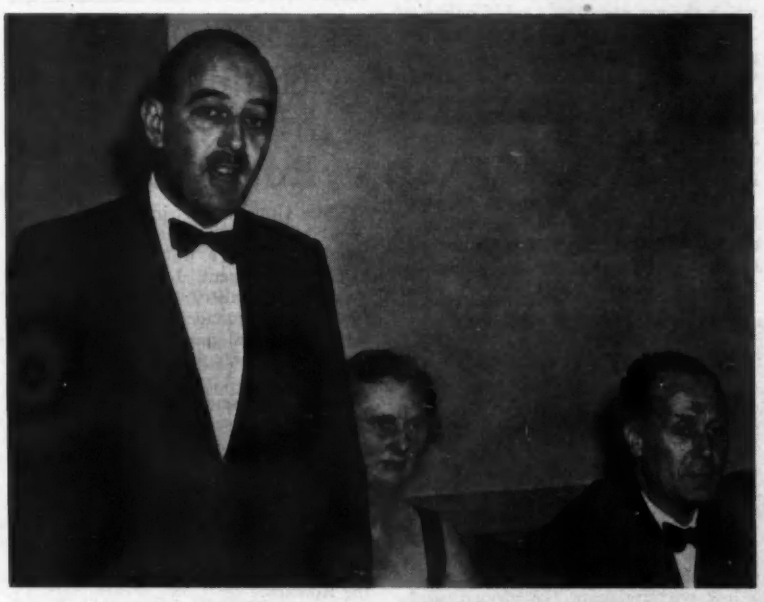
Annual Report was the theme of the

EAST MIDLANDS CONFERENCE

Chairman Reviews Present Production Position

THE East Midlands Gas Board's Area Staff Conference, held as usual at Skegness, followed the pattern of former conferences in all respects but one. It had been brought back six months to enable the annual report and accounts to be discussed, and these formed the subject of all papers presented by officers of the Board. Under the genial chairmanship of Mr. R. S. Johnson, M.B.E., T.D., M.A., LL.B., the 250 delegates, who included the Chairman and members of the Consultative Council and representatives of the N.U.G.M.W., N.A.L.G.O., and B.G.S.A., found the proceedings a source of enlightenment and inspiration.

On October 24, after a civic welcome had been extended by the Chairman of the Skegness Urban District Council, Councillor J. H. Edwards, the conference got under way with the Chairman's address.



Mr. R. S. Johnson, Chairman of the Board, speaking at the dinner which, followed by a reception and dance, concluded the conference. Also in the photograph are Mrs. Haslam Wood, wife of the Chairman of the Gas Consultative Council, and Mr. E. H. Harman, Deputy Chairman.

Dealing first with production and distribution, Mr. Johnson said that of the amount of coal carbonised during the year (1,630,000 tons), some 1,200 tons was of a variety of low-caking coals which were used in special blending tests. Experiments were continuing at Car House Works, Rotherham, where a comprehensive coal preparation plant for the intermittent vertical chambers was installed. A Bradford breaker and two Pennsylvania hammer mills broke the coal down to 80% less than ¼ in. before it was taken to the blending bunkers. In this way it was possible to blend coals of different types. Blends of low rank and carbonising coals were being used in an attempt to produce a coke more readily ignitable in the open fire. 'Our experiments on these lines are not yet complete and at this stage I will only say that they are not without promise.'

If these experiments were successful, it was their intention to introduce coal blending at Neepsend and Grimesthorpe Works, Sheffield, where the new handling plants were laid out for the addition of coal preparation plants on the same lines.

The yields of gas and coke per ton of coal carbonised were further improved to 74.7 therms and 11.37 cwt. respectively, but unaccounted-for gas, at about 8%, continued to cause concern. The cure of the evil must depend to a great extent on the spending of capital money on the replacement of mains and services and consumers' meters that were worn out beyond useful repair.

Their construction programme had progressed, notably at Neepsend, where the first section of new horizontal chambers had been put to work in February last; at Car House where work was continuing on the intermittent verticals; and at Meadow Hall (Sheffield) and Northampton, where construction of two catalytic oil-gas plants had been started to provide them with sorely needed flexible plant of a capacity of 10 mill. and 6 mill. cu.ft. per day respectively, at relatively low capital cost.

During the year integration had proceeded. Works had been closed down at Wath-upon-Dearne, Thrapston, Oundle, Alford and Spilsby, making the total number of works closed down since vesting date 61. Some ten miles of main had been laid from the 'backbone' main between Chesterfield and Derby to convey gas to the Matlock district in order to meet a considerable expansion of the industrial load in excess of the capacity of the main from Sheffield through which Matlock was formerly supplied.

Mr. Johnson then referred to coke oven gas. The proportion of gas bought from coke ovens to total gas available for sale had risen from 51.44% in 1955-56 to 57.24% in 1956-57. The second battery of ovens at the Avenue plant of the East Midlands Division of the National Coal Board had commenced delivery into the Board's grid system on November 7, 1956. Additional gas from extensions at the Manvers plant of the North Eastern Division of the National Coal Board had been received into the Board's grid system on November 27, 1956, and the supply from this source was gradually built up until February, 1957, when the plant was sending 19.5 mill. cu.ft. per day, representing an increase of about 13.3 mill. cu.ft. per day.

Coke Oven Gas

'One of the problems resulting from the receipt by us of so much coke oven gas,' he continued, 'is that it is essentially a base-load supply—i.e., the coke oven owners like to send us similar quantities on every day of the year. On the other hand, our domestic and commercial consumers like to use much more gas in the winter than they do in the summer and our industrial consumers shut down completely at week-ends and during holiday periods. The result is that in times of maximum demand we have to bear the very high cost of making peak-load gas and, in times of minimum demand, we have to run our own plant, designed for base load, at very high cost because it has to be used at less than its proper capacity. And when we have done our utmost, in times of minimum demand, occasionally happens that the coke ovens have surplus gas that we cannot absorb. This has to be burnt to waste, and is noticed by a vigilant public, whose complaints we receive. I mention all this in case anybody should tell you that the receipt of coke oven gas is an unmixed blessing. Obviously it is in the national

interest and in our own interest that we should take it, but it presents us with special problems.'

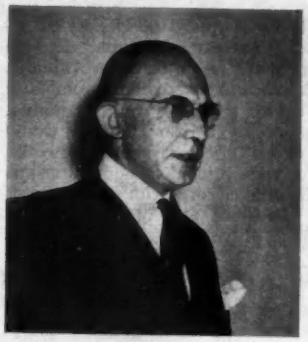
Turning to coke production and sales, he reported that they had ended the year with an abnormally large stock of 71,200 tons, a figure which had since greatly increased. 'Our experience in this respect conforms to the national pattern,' added Mr. Johnson. 'I always think that the desirable objective is to sell out the shop so far as coke is concerned, at the end of the winter, thus converting our coke into money and avoiding deterioration and the cost of double handling. However, temperature and certain other conditions were against us and we were not able to achieve this desirable objective in 1956-57.'

He continued by outlining the schemes of education and training undertaken by the Board and labour relations.

Look at the Future

Describing 'A Look at the Future,' Mr. Johnson made reference to the fact that the extension previously under consideration of the carbonising plant at Doncaster had now been indefinitely postponed. They had had notification of possible additional supplies of coke oven gas in 1961 and a final decision on the further large oil-gas plant contemplated had to await clarification of the coke oven gas position. They were, however, going to install at the Dinnington Works a small oil-gas plant with a nominal daily capacity of 4 mill. cu.ft. to secure the maintenance of the supply in the meantime. Moreover, to provide additional gas and much needed flexibility in the inter-connected divisions of Notts. and Derby and Leicester and Northants. an oil gas plant with a nominal daily capacity of 10 mill. cu.ft. would be installed at Aylestone Road, Leicester. The completion of the final link of the 'backbone' main between Sheffield and Chesterfield was intimately associated with the proposed additional coke oven gas supplies and would, he thought, have to come.

Mr. Johnson stressed the importance of industrial gas, which accounted for nearly half of their business. 'Nevertheless,' he said, 'it is a part of our business that continues to grow and it is not unnatural that I should speak of the need for special effort in selling gas to the domestic customer. Here I think we have grounds for optimism.' He explained that the general purpose tariff gave strong inducement to the small consumer to use more gas; and the two-part tariff recently introduced, gave strong inducement to the good domestic consumer to use more. 'I hope that nobody will hold back from selling hard into the domestic and commercial markets because of fears about the availability of gas or about the capacity of the fitting strength to deal with it. I would rather have complaints that we are getting behind in our fitting work because business is thriving than peace and quiet because business is sagging. We can cope with the fitting problem.' Having described some of the new appliances available, Mr. Johnson concluded 'so let us not be downhearted.'



CHIEF ACCOUNTANT

Facts Behind Figures

● **G. A. HOWARD**

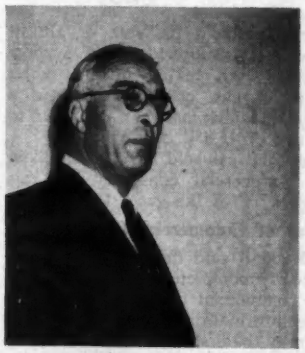
The first of the three papers by senior Board officers was 'What Our Accounts Can Tell Us,' presented, appropriately enough, by the Chief Accountant, **Mr. G. A. Howard.** Mr. Howard's aim was to highlight certain features of the annual accounts, and to explain a few of the facts behind the figures. He emphasised the importance of occasionally looking at the 'whole picture.' They existed as a Board to produce and sell what the public required and was willing to pay for. At some point they must set their expenditure against their income; costing and budgeting techniques would generate greater operating efficiency and help to increase their prosperity provided they were doing the right jobs—in other words, if they were carrying out the right policy. They must, however, be in a position to test this.

Mr. Howard pointed out that the annual accounts formed one of the best means of assessing the overall effects of their policy because they showed the monetary yield from their investment of capital and labour. The interplay between functions often made it difficult to judge whether each one was carrying out the best policy for the overall good of the Board and it was only when activities were merged in one document in terms of a common unit that a fair opinion could be expressed.

Mr. Howard thought they might say that their financial progress since 1949 had been sound having regard to the difficult conditions which had ruled. Their profit margin remained narrow and they must endeavour to increase it without adding to their total costs. This could, in his opinion, be achieved if they examined their methods with a view to eradicating all those which were wasteful of time, labour or money and replacing them with systems of greater efficiency designed to work as part of a co-ordinated whole.

Mr. Howard illustrated his paper with lantern slides, one of them showing the accounts of the Northampton Gas Company in which the sources of revenue from by-products included such unusual items as fruit and grass!

In the ensuing discussion the principal contribution was made by Mr. C. A. Brain, Lincolnshire Divisional Accountant, and other points were made by Mr. Bernard Clarke, M.B.E., Lincolnshire Divisional General Manager, and Mr. T. W. Dodds, Horncastle.



CHIEF ENGINEER

A Future for Coke

● **F. G. PYPER**

The following morning it was the turn of the Chief Engineer, **Mr. F. G. Pyper.** In his paper he attempted 'in simple and non-technical language, to clothe with reality the bare facts of gas production and distribution which are set out in the Board's annual report, to show the possible trends in the Board's area, and finally, to look still further ahead at developments in the industry as a whole.' Summing up, Mr. Pyper said that there were a number of interesting and exciting possibilities developing on the production side of the industry and of these the pressure gasification of small coal appeared to hold out the best prospect of a cheaper gas therm. All the new development work was towards the production of gas only and this would present a new set of problems to an industry which had been based on two fuels for many years. Had coke a future or should the gas industry base its future on supplying a single fuel? This was one of the many problems facing an industry which, although it had

been dying for many years, refused to lie down, consistently increased its output and was developing revolutionary processes for the manufacture of gas in the future.

A lively discussion followed in which **Mr. C. C. Wood,** Divisional General Manager, Sheffield and Rotherham Division, took up the question of coke oven gas. There were, he said, limits to their dependence on gas from this source, due to the uncertainty of supply. Operators in the coke oven industry did not give the same degree of reliability common in the gas industry. On the future of coke, he pointed out that there were increasing quantities being produced in the north of the area, but the new developments being made towards a cheaper therm might result in coal no longer being the cheapest raw material; as a result they might be moving towards a one-fuel industry.

This last point—one fuel or two—was described by **Mr. Johnson** as the 64,000 dollar question. Few materials could suffer the cost of double handling; they did not want to have to handle coke out of the works after handling the coal in.

Mr. J. B. Leaman, the Board's Coke Marketing Officer and Deputy Coal and By-products Officer, pointed out that whatever its future might be, coke had an immediate present, contributing £4½ mill. net revenue 'after the accountants are satisfied,' and provided an excellent fuel for them to sell at 4d. a therm. In the right appliance coke was still the cheapest fuel for space heating. 'We are still a two-fuel industry—let us go forward with two-fuel minds,' he concluded.

No Requiem Mass

Dr. M. Barash, the Coal and By-products Officer, said he was not joining the requiem mass for Mr. Leaman. Their Board was in the fortunate position of enclosing in its bounds two of the best coal producing areas in the country, perhaps in the world. They could thus produce coke with a wide range of properties. However, if it was decided that they required certain coals to produce more reactive cokes, those coals could not be just taken off the shelf. They must be expeditious in deciding what they wanted and then be patient. He emphasised that the N.C.B. did their best to co-operate.

Mr. K. L. Pearce, Notts. and Derby Divisional General Manager, recalled experiments in non-caking coals in the past four years; as soon as their demand became known the coals disappeared off the market at that price. He wondered whether gas produced by Lurgi or hydrogenation would go into the holder cheaply enough to carry the capital charges. He pointed out how close coke oven interests were getting to the function of gasworks, particularly in those cases where they were producing both gas and coke for domestic use.

Mr. Johnson pointed out that if it were suggested to the coke oven operators that because they were getting close to the gas board's method of operation, they should accept the same stringent conditions, they would immediately think in terms of an increase in price.

Mr. E. H. Harman, the Deputy Chairman, said that no irrevocable decision had been taken on oil or coal. Although they had virtually recovered from Suez they could always suffer another. Devaluation of British currency would result in oil prices rising. However, plans for conventional carbonising plants must be looked at 'with a suspicious eye.' He spoke also of the 'negative flexibility' of coke oven gas supplies which resulted in lower winter supplies.

Mr. E. Bates, Notts. and Derby Divisional Sales and Service Manager, asked whether the gas of the future would be sulphur-free, to which **Mr. Pyper** replied that sulphur might well be so low 'that your mouth will water at the thought of it,' and **Mr. C. E. Mills,** Sheffield, pointed out for over 12 months' gas from the Car House works had had only 9-12 grains of sulphur per 100 cu.ft.

COMMERCIAL MANAGER

Selling for the Future

● **L. F. RANDALL**

Entitling his paper 'Past Trends and Future Prospects in Gas and Appliance Sales,' **Mr. L. F. Randall,** the Commercial Manager, said that there had been a steady, even if not spectacular, climb in the amount of gas sold by the Board. The main increases had been in sales to the industrial and commercial consumers, and these in themselves could be regarded as outstanding. He pointed out, however, that because of the magnitude of so many of the industrial loads in works and factories, much of the gas was purchased at the prices of the lower blocks of the general purpose tariff with the result that the average price recovered was as low as 11.41d. a therm. Thus the Board obtained only 37% of their gas sales revenue from the sale of almost half the gas it supplied. The average commercial user, taking much smaller quantities of gas, consequently paid a higher price, which last year amounted to an average of 15.85d. a therm.

Of the total gas sold 9.26% was taken by the commercial consumer but this provided 9.7% of the gas sales revenue.

Survey of Commercial Consumers

Mr. Randall said that his department had recently completed a survey of the smaller commercial consumer and much valuable information had been obtained. The survey had shown that the small commercial user paid a high price for electricity and it was apparent that there would be very few instances where gas, at its present price, could not show substantial savings in fuel costs.

The domestic consumer, while taking only 39% of the total quantity of gas sold, had provided the Board with 51.19% of its gas sales revenue. 'The whole of the Board's selling effort must be directed to the sale of appliances, and it should follow that once the appliances are installed, then if the tariff for purchasing gas is satisfactory, the overall demand for gas will increase.

Although less gas and less appliances had been sold during the past three years consumers had actually spent an increasing amount of money with the Board. Could it be deduced from these figures that consumers were not prepared to spend more than a limited amount extra on gas and therefore each increase in price only had the effect of reducing the amount of business obtained? This was not thought to be so but the figures indicated the retarding effect which price alteration, hire purchase controls and the general uncertainty which such measures produce could have on a sales programme.

Space Heating Potential

Speaking of the future, Mr. Randall said that the widespread use of gas for heating the home was not a dream in the minds of enthusiastic gas salesmen; it was a real and practical possibility under today's conditions. Explaining that a somewhat crude calculation could illustrate this point, he demonstrated that if each of the 1,135,000 domestic consumers in the area was assumed to use 2 tons of coal each year, and this was regarded as a low figure, then to replace this coal by gas to give the same heat service would require 227,000,000 therms a year. Their present sale of gas to these domestic consumers for all the requirements in their houses, for which they were at the moment using gas, was 112,600,000 therms. Thus a complete change-over from coal to gas would make it necessary for the Board to provide three times the amount of gas it did today. The Board was being helped in two directions—by the technical improvements in modern gas fires, and by the bold policy of the Board in a time of financial stringency in introducing an option two-part domestic tariff. There were over 1,135,000 domestic consumers already connected to the mains and if these could increase the consumption

within the restricted limits of home requirements, then this gas was equally as important to the Board as the industrial consumer making big increases in his load and for which the general purpose tariff provided reducing prices.

As a result of the two-part tariff, oil, which hitherto has been carrying everything before it, would receive competition from gas on price alone and not as in the past on the higher price of gas being reduced by taking into account other amenities. A further important point about the tariff was the provision which has been made to service regularly all the gas appliances in the consumer's home.

Future Competition

Mr. Randall concluded by assessing future competition. In general, he said, it was estimated that the total demand for fuel would increase year by year. Consequently, any additional means of producing fuel which could be introduced either by nuclear power, water power, or by natural gas must be developed as rapidly as possible and, while there would be keen competition between the suppliers of fuel to obtain the biggest share of this growing demand, it was quite evident that the demand itself would be of such an order that all the sources of fuel would still be required to meet it; in the foreseeable future there could be no question of one source of fuel eliminating all others. 'This means that the consumers' selection of the type of fuel and apparatus will continue, the only thing being that competition will become keener. Electricity has been in the position to compete with the gas industry for most loads for more than half a century and, therefore, the future should hold no fears or problems which cannot be surmounted by the collective efforts of the staff of the East Midlands Gas Board.'

Opening the discussion, **Mr. J. Corrigan,** Leicester and Northants Divisional Sales and Service Manager, commented on the emphasis laid in both Mr. Howard's and Mr. Randall's papers on the contribution to revenue of appliance sales; at one time appliances had been regarded as a means to an end. He made a strong plea for the assistance of all Board employees in selling space heaters—'the salesmen cannot carry this through alone.' For the first time in 20 years they were able to make the statement that gas could be cheaper than coal for space heating, and their two-part tariff was 'the envy of the country.'

Sales Training Programme

Mr. R. H. Holland (Heanor) wondered how their sales training programme compared with that of their competitors, and asked what initial training Mr. Randall felt should be given to salesmen, and by whom. He made a plea for showroom doors to be open all the year round using the curtain of warm air employed on the Continent.

Replying, **Mr. Randall** said that sales training began at home, and stressed the efforts the Board was making to keep salesmen in the picture. He had seen an early example of the ever-open door; women had been frightened to cross the threshold and small boys had found it an engaging adventure. He felt sure they could find some easier means of attracting customers, even if it was necessary for them to lift the latch.

Mr. J. Cooper, the Board's technical officer on appliance testing, said that despite what had been said concerning sulphur reduction, he anticipated that sulphur was likely to remain where it was at present. They must get used to the utilisation of electricity in the design of gas appliances. For years they had been selling gas-electric washing machines, all for ten therms a year. Soon they would have the cooker of which mains electricity was a part; they sought the end of the permanent pilot. Mr. Cooper also commented on the potential of selective air heating which could result in a sale of 250-300 therms a year, the *interim* development of convector fires, and the improvement in flues. Lastly, he speculated on the possible importation of Continental appliances.

In the afternoon session the guest speaker was **Mr. R. M. Currie,** C.B.E., Head of the Central Work Study Department of Imperial Chemical Industries Ltd. In a fascinating address on 'Work Study,' a management science the employment of which has rapidly increased in many industries during recent years, Mr. Currie explained something of its nature and the benefits obtainable.

Experience of Work Study

In the circumstances nothing could have been more helpful and encouraging than the remarks made by **Mr. W. R. Branson,** Deputy Chairman of the West Midlands Gas Board, who opened the discussion. It was, he explained, three years since his Board agreed to the appointment of its first work study officers. Some of the results achieved had been reported to the Institution of Gas Engineers in May by Bassett and Bryce. He would be the last to claim that these results were spectacular and they had a long way to go before they caught up with Mr. Currie's company. Nevertheless, they were, in spite of inevitable difficulties, becoming more and more convinced of the rightness of their decision of three years ago.

His Board had decided that work study staff should be attached to divisional general managers and that, at least initially, there should be no H.Q. staff. This had avoided any feeling that work study officers were a sort of Ogpu prying into the inefficiencies of management. Another early decision they had had to take was whether to employ specialist consultants. His Board had decided to recruit work study officers from its own staff and to give them the necessary training. They had not regretted their decision though it had meant the removal of some of the best of their younger engineers from their posts.

Discussion with the trade unions had begun as soon as a decision had been reached by the Board, and Mr. Branson spoke highly of the co-operation which they had received from the T.U. side of their Area Joint Industrial Council. The whole-time officials had been particularly helpful and had been invited at an early date to attend appreciation courses along with their senior managers. More recently they had organised courses for trade union branch secretaries and foremen jointly drawn from departments where work study officers were or would shortly be operating. Ideally this should have been done earlier and might have made some of the first applications easier.

Most of their attention had been devoted to carbonisation and associated activities, and Mr. Branson concluded by quoting some relevant figures.

Mr. A. Gwynne Davies, M.B.E., Secretary of the Board, Mr. F. L. Ffoulkes, Industrial Relations Officer, and Mr. K. L. Pearce, Notts. and Derby Divisional General Manager, also contributed to the discussion.

The Last Word

'Headquarters must have the last word,' said **Mr. E. H. Harman,** the Deputy Chairman, as he summed up the conference. Mr. Currie's address he described as 'a warning dish.' The gas industry had been in a death struggle with electricity for the past 30 years: Could they now afford to ignore work study? If the Board ignored it would they (the delegates) regard the Board as backward? If the Board adopted work study would they feel 'messed about?' These were points to think about, suggested Mr. Harman. Turning to Mr. Pyper's paper, he remarked that the Beaver Committee had clutched at coke as a drowning man clutched at a straw. Of the 12 mill. tons of coke sold only 2½ mill. tons went to the domestic market, and he thought Englishmen were going to stick to open fires for a long time to come. Mr. Harman went on to deal at some length with the difficulties resulting from the supply of coke oven gas. In connection with Mr. Randall's paper he pointed out that nothing started until an appliance was sold. They had a group bonus scheme, a prospect card scheme, a dealer scheme, a builders' prospect card scheme—but it was questionable whether any of them had improved sales. He did not think they could overcome Government restrictions and they must be careful not to get back to a ten-week delivery for gas cookers. The oil heater was not all it was cracked up to be. If the Board took all the sulphur out of their gas, the next complaint would be condensation, and what was the answer to that?

The very last word went to the **Chairman.** 'Where there's a will there's a way' he said, 'and I think I can detect the will to win here among us.'

Joint Symposium

The Institution of Chemical Engineers, the Society of Instrument Technology, and the British Computer Society are jointly organising a symposium on 'Instrumentation and Computation in Process Development and Plant Design,' in London in the summer of 1959.

Gas on the Continent

Heat Treatment in Powder Metallurgy

BY M. COQ AND M. HAUSER

MODERN manufacturing processes involving the mass production of high precision components are making ever increasing use of powder metallurgy. This, of course, involves the compression of powdered metal in a mould followed by sintering or heat-treatment to complete the process.

Compression is effected in high-output automatic presses, which can cope with 1,000 to 2,000 articles per hour, fed with a mixture of metallic powders and a powdered lubricant. The mixture often includes constituents of an alloy which is modified in the course of the sintering operation. Sintering is carried out in a reducing atmosphere to eliminate superficial layers of oxides which inhibit the phenomena of diffusion; and is effected in continuous electric furnaces with nickel-chromium or molybdenum alloy elements.

The atmosphere in which sintering takes place plays an important rôle since it often reacts with certain non-metallic constituents of the mixtures. An example of this is hydrogen which, in the presence of graphite, forms hydrocarbons and results in the decarburation of the process materials. Ferrous metals, particularly steels, are involved, though steel powders are seldom used, because they compress badly, and it is better to use a mixture of iron and graphite powders which are transformed into steel by sintering. In order to prevent the decarburising of the articles in hydrogen, they are protected by producing an atmosphere of CO which is non-decarburising. The articles are generally placed in graphite containers which act as shields and generators of CO.

Limiting decarburation is not always successful, however, since the proportion of carbon at the furnace mouth varies considerably. To attain 0.9% of carbon on completion of sintering often necessitates a mixture of powders containing 1.2% of graphite or more.

Protection of the articles against decarburation during sintering can be achieved by replacing the hydrogen or cracked ammonia atmosphere by a non-decarburising gas. Such a gas can be obtained by the partial combustion of a mixture of town gas and air in the presence of a catalyst. The proportion of air to gas being fixed at about 0.5, the reaction is endothermic and the products of combustion are composed, approximately, of H_2 40%, CO 20%, and N_2 40%. This gas is sufficiently reducing to eliminate the layers of superficial oxides which oppose sintering. Its dew-point is sufficiently low and its content of CO_2 sufficiently small to prevent de-carburation.

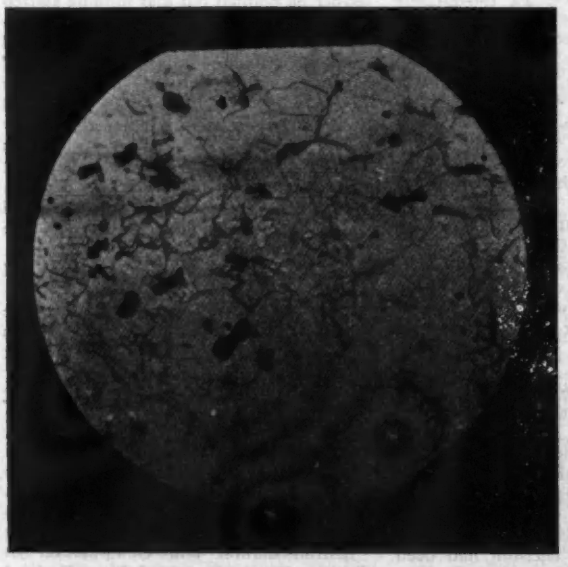


Fig. 1. Iron × 500.

Fig. 2. Bronze × 500.

Although these two methods are largely used in industry, both suffer from the disadvantage of forming steel before calibration and finishing. It becomes necessary to calibrate articles which are hard and not very ductile and there is considerable wear of tools. It would certainly be desirable to develop, at the end of the cycle of operations in powder metallurgy, gaseous cementation which would carburise the articles, either on the surface or in the interior.

The following investigations were carried out in the first place to define the conditions involved in the use of an economical gas, such as producer gas, for sintering bronze and iron articles. They were also intended to develop gaseous cementation in the course of sintering iron articles, and finally, to effect the gaseous cementation of sintered iron articles.

The first and third of these aims were achieved, and industrial processes were successfully developed. Cementation in the course of sintering, however, is unattainable for technological reasons.

Theoretically, at a temperature of 1,150°C., the reducing action of hydrogen greatly exceeds the oxydising action of the CO_2. In practice, the gas has a strongly de-oxydising effect on pure iron and an oxydised article placed in a furnace at 1,150°C. is de-oxydised in about one minute.

With regard to steel, this gas is in practice in equilibrium with a steel containing some hundredths per cent. of carbon. Two methods are employed to bring the gas into equilibrium with steel containing 0.9% carbon—these are to dehydrate it or to enrich it with a carburising gas such as pure town gas.

Turning to apparatus and test methods, a 60 mm. diameter furnace was available capable of reaching temperatures up to 1,200°C., and provided with means of control. A steel tube specially cooled at one end constituted a gas-tight muffle in

2 in every 5 tons of coal

carbonised

2

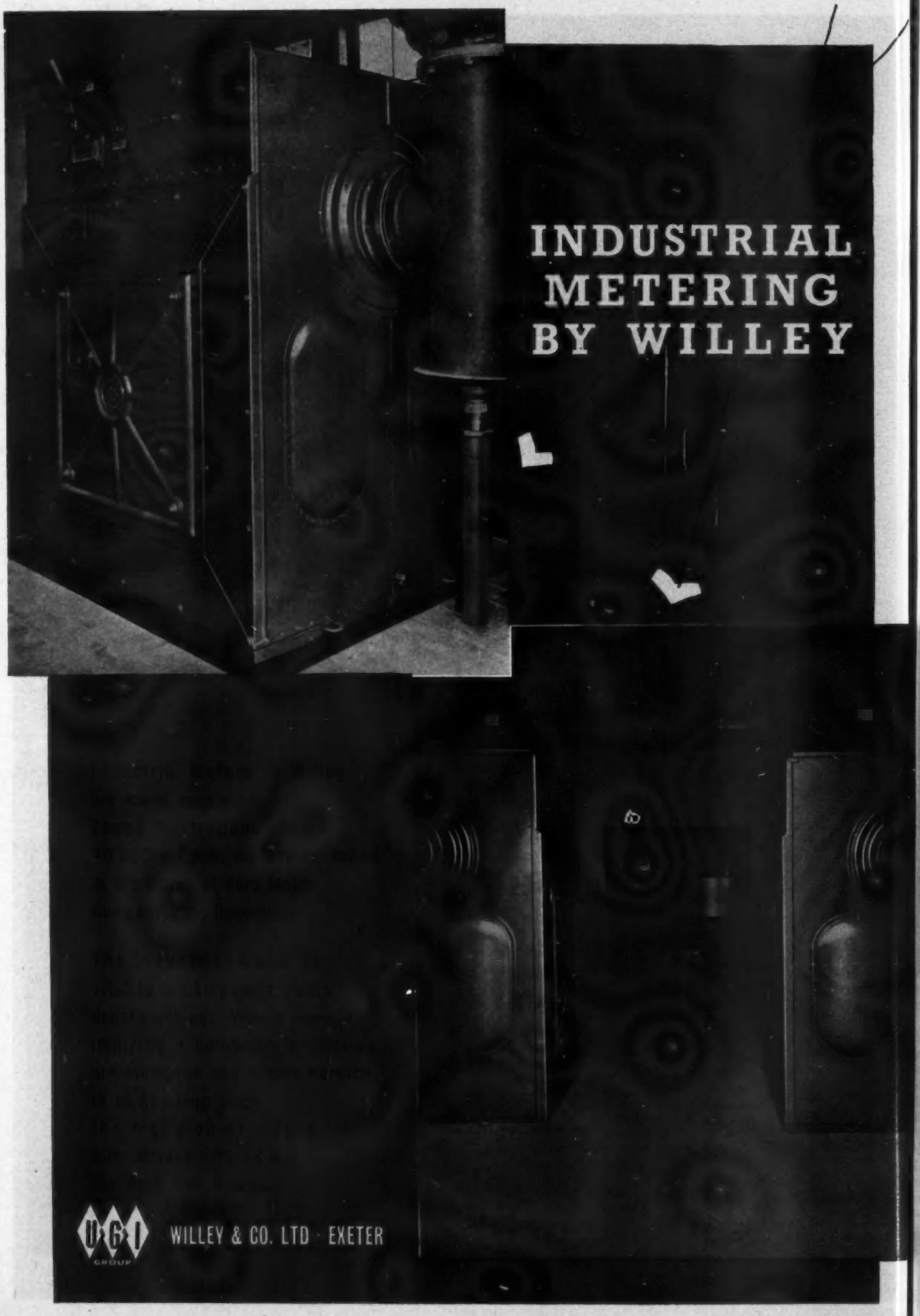
in Great Britain

are processed in plants

designed, built and serviced

5

by Woodall-Duckham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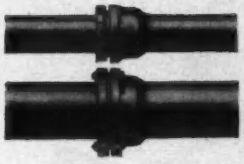

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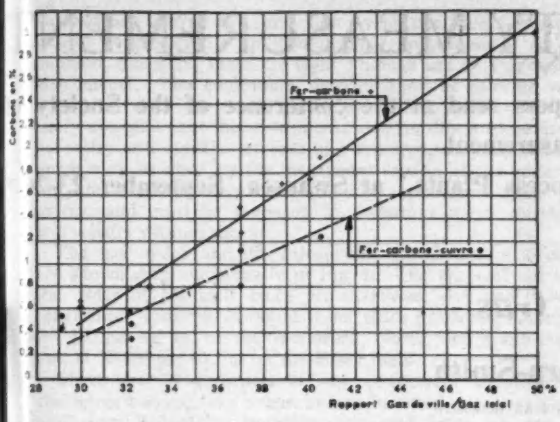


Fig. 3. Carbone en%, carbon %; fer-carbone, iron-carbon; fer-carbone-cuivre, iron-carbon-copper; rapport gaz de ville/ gaz total, proportion town gas to total gas.

which stoving could be carried out in the required atmosphere. A precision meter completed the arrangement.

Copper articles may be placed in the hot part of the furnace and cooled in the cold zone after heat treatment by means of a rod passing through a stuffing-box without opening the furnace.

Cooling is thus effected in the furnace atmosphere itself without contact between the articles under test and the outside atmosphere. On the other hand, cooling can be effected rapidly enough to prevent reactions between metal and atmosphere and to ensure that the surface condition of the article remains the same as it was at the treatment temperature.

Turning to the sintering of iron, samples of sintered iron were used in the form of rings, 16 by 20 by 4 mm., in two qualities—FA and FE (pure iron and iron plus copper). These articles were compressed at 4 tonnes per sq. cm. (25 tons per sq. in.). They were sintered at 1,150°C. for 60 minutes. Tests of tensile strength carried out by the 'Carbone Lorraine' laboratory gave values between 12 and 15 kg. per sq. mm. (17,000 and 21,000 lb. per sq. in.) for the pure iron and 15 and 20 kg. per sq. mm. (21,000 and 28,000 lb. per sq. in.) for the iron-copper.

Fig. 1 shows a microphotograph of these samples.

Turning to bronze, rings of two sizes (12 by 15 by 12.4 mm. and 18 by 22 by 17.3 mm.) were sintered after several attempts at 825°C. for 25 minutes. Satisfactory results were obtained, confirmed by breaking tests and the microphotograph shown in Fig. 2.

Turning next to steel, the first consideration was the sintering of articles containing 1% of carbon and their projection during stoving at 1,150°C., by an atmosphere of producer gas mixed with pure town gas, the whole dehydrated at −20°C.

Different mixtures were tried between 30% and 50% of town gas. The samples treated in these atmospheres were then examined by microphotography and their carbon content determined by combustion. The results are shown in Fig. 3 for the two types of steel treated—iron-carbon and iron-carbon-copper.

Examination of these graphs leads to three conclusions—(a) the results obtained are dispersed around the mean value, (b) the slope of this mean value is steep which means that a small error in the proportion of town gas in the mixture leads to a considerable variation in the carbon content, and (c) the steel containing copper is less sensitive than the plain carbon-steel. This is logical since the copper hinders the diffusion of carbon.

The great dispersion of the results, probably due to a considerable catalytic activity of the iron, and the excessive slope of the curve leads to the conclusion that this method is too sensitive for industrial exploitation. We therefore decided to carry out on articles previously sintered at 1,150°C., a standard cementation at about 920°C. in an atmosphere now being used in industry. The fact of working at a much lower temperature should allow of the more accurate control of the diffusion of carbon.

We come next to the case hardening of iron. Tests have been carried out in an industrial plant at 920°C. in normal operation on samples of pure iron and of iron-copper.

The first tests over 60 minutes gave carbon contents in the region of 2% which shows the considerable catalytic activity of the sintered iron. Altering the time to 20 minutes gave average results of 0.85% for steel-copper and 1.0% for steel.

If the ratio of steel to copper is of high accuracy, the copper having retarded the cementation, then that of pure steel was too strong. In a second series of tests the time of cementation was fixed at 15 minutes. Under these conditions the average carbon content was fixed at 0.85%. Further, two essential characteristics were noted.

Dispersion among the articles was acceptable and distribution of carbon in the interior was quite satisfactory. This method, therefore, appeared likely to give the most constant results in the manufacture of articles which are so sensitive to atmospheres controlled by their own nature.

Fig. 4. Steel × 500.

Code for Boiler Tests

FIFTY years ago the Institution of Civil Engineers made recommendations for the carrying out of trials on boilers. The document which emerged—the Code of the Heat Engines Trials Committee—was last revised in 1927, and is still considered to be an authoritative source of knowledge on the subject. The Code is, however, now out of print; and its re-appearance in 'British Standard' form stems from an agreement that the B.S.I. should undertake the work of revising it. The Code applies to stationary steam-generating units of the power-station type.

The general pattern of the contents now aligns with that of other British Standard test codes and with similar codes issued in Germany and America. That the document will pave the way for a co-ordinated international approach to the subject is clearly foreseen in B.S.I.'s current annual report, an extract from which reads: 'The Code . . . will serve as a basis for draft proposals to be circulated to members before the first meeting of this committee.' (ISO/TC 64.)

The Code contains sections dealing with the use of gaseous, liquid, and solid fuels. And since one of its objects is to provide for the tabular presentation of test results, the latter half of the document contains many specimen 'standard forms' which—for easy working—are adequately cross-referenced one to another.

Copies of this document may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1. Price 12s. 6d.

AUTOMATIC QUALITY MEASUREMENT

From papers read at the conference of the Society of Instrument Technology on 'The Automatic Measurement of Quality in Process Plants,' at Swansea, September 23-26.*

● *Control of Quality in Town Gas*

By J. Sharp-Smith

(NORTH THAMES GAS BOARD)

THE quality of town gas, like that of any other product, should be constant. The standard chosen by one board need not be the same as that of another but whatever standard is chosen should be maintained with very little variation as only in this way is it possible to ensure satisfactory operation of gas-burning equipment. The term 'quality' refers mainly to calorific value but density, composition, and other factors are involved.

The Boys manual calorimeter is the fundamental instrument for the determination of calorific value in this country. Its automatic counterpart is the Fairweather recording calorimeter. Another instrument which is used to some extent, and which is of comparable accuracy, is the Thomas recording calorimeter. In this instrument the heat absorbing fluid is air and this has many advantages. It is cheap, always available, and needs no service pipe to bring it to the instrument; as it obeys the same gas laws as does the gas of which the calorific value is being determined, and as both are measured under similar conditions, no correction has to be made to the temperature rise in order to adjust the calorific value to the standard conditions of temperature and pressure, namely, 60°F., 30 in. mercury, and saturated with water vapour.

Gas is supplied to the instrument at about 0.4 cu.ft. per hour and its rate is controlled by a driven meter. The heat-absorbing air and the air for combustion are also supplied by driven meters which are on a common shaft connected by gearing with the gas meter shaft. The three meters are wet meters and are situated in a common tank in which is also the heat interchanger. The gas burns at the orifice of a silica tube and the heat evolved is conducted through a silica- and gold-lined interchanger to the stream of heat absorbing air. The temperature rise is measured by resistance thermometers and is recorded as B.Th.U. per cu.ft. The recording unit was for many years a balanced Wheatstone bridge unit, the movement of the tapping point being controlled by a galvanometer and effected in the early models by a hot wire meter and later by a fractional H.P. motor geared down. In modern units the control is by electronic means.

The Thomas was chosen for the Beckton works in preference to the Fairweather because it was believed that its lower running and maintenance costs would out-weigh its higher initial cost. As a result of the 30 or so years' experience with this instrument we are able to say that in reliability and accuracy the Thomas and the Fairweather are comparable; the Fairweather has a distinct advantage in that it is possible to check the accuracy of each component and the Thomas is extremely valuable in that it is relatively insensitive to changes in ambient conditions; thus it is possible to use it in rooms which are of the character of workshops without much impairment of accuracy although, of course, a properly designed room is desirable.

Since the Thomas instrument cannot be verified by an internal check in the way that the Fairweather calorimeter can, certain routine checks have to be made to ascertain that the instrument is working properly. They are the cold balance and the air-gas ratio, and they respectively show if the thermometer circuit is in order and if the meters are in balance. A completely independent check with a Boys manual instrument must be made to verify the record. Calibration by running the instrument on pure hydrogen has been suggested and is sometimes done. It is not a very satisfactory method because the calorific value of hydrogen is remote from that of coal gas and because the purity of the hydrogen must be ascertained by an accurate gas analysis, an operation which presents some difficulties.

At Beckton 15 Thomas calorimeters were installed in 193[illegible] and two others were added later. During the war and for a few years afterwards it was difficult to get these instruments repaired or replaced and it was decided that the extensions to the calorimeter room which have been necessary since the war due to the expansion of the works should be equipped with

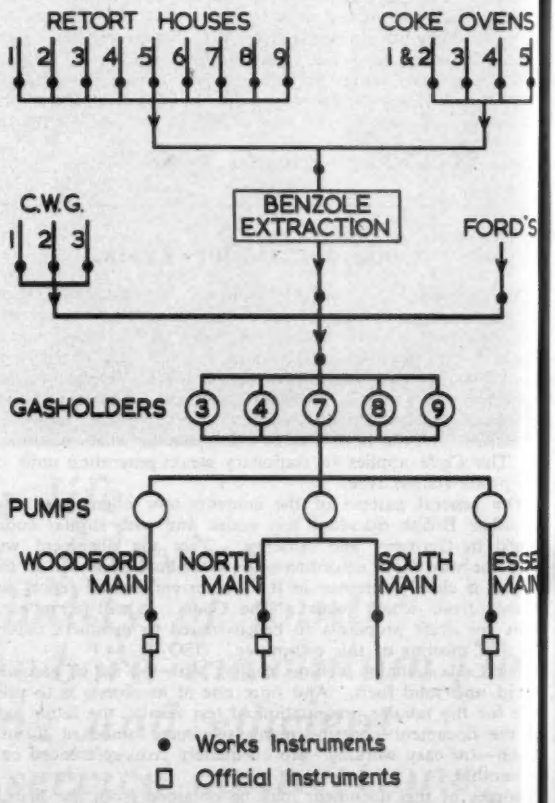


Fig. 1. Diagram of gas mains at Beckton showing position[illegible] calorimeters.

* The proceedings will be published by Butterworths Scientific Publications.

Fairweather instruments and that eventually this instrument should replace those in the original installation. At the moment, therefore, there are eight Thomas and 15 Fairweather instruments. The continuous determination of calorific value is of such vital importance to the gas industry that it is absolutely essential that the instruments used for this purpose should be easily and quickly serviced and repaired, so that, although much may be done by the instrument section of the undertaking, the manufacturers must provide an efficient spare part service and must be prepared to undertake major overhauls and repairs without delays.

The gas mains and the calorimeter installation at Beckton are shown diagrammatically in Fig. 1. The gas sent out is of the order of 150 mill. cu.ft. per maximum day and it is all distributed from the works at trunk main pressures, namely at 2-4 lb. per sq. in. on the Woodford, North, and South mains, and at 50 lb. per sq. in. on the Essex main.

There are 17 recorders on the constituent streams from the retort houses, coke ovens, and carburetted water gas plants, and since benzole is normally extracted from the gas, the calorific value on the inlet and outlet of the plant is recorded.

The primary control of the mixed gas for distribution to the consumer is effected through a calorimeter on the inlet of the gasholders. There is a calorimeter on each of the four mains leaving the works, and the Ministry of Power has an official calorimeter on three of them; the fourth main is considered to carry the same gas as one of the others.

The calorimeter installation is used for three purposes: (i) Control of manufacture; (ii) control of the quality of gas sent on to the district; (iii) official control of the supply. The last, of course, is the concern of the Ministry of Power and is solely for the protection of the public.

The control of the calorific value of the gas sent out is the responsibility of the shift valvemen who instruct the plant foremen as to the calorific value and output that is required. As on most works, the calorific value is controlled by one or more of the following methods: (i) An alteration in the amount of oil used in the carburetted water gas plant, (ii) an alteration in the amount of carburetted water gas made, and (iii) an alteration in the degree of benzole extraction. (Where vertical retorts are used an alteration in the amount of steaming may also be used to effect a change in calorific value). General control of output is effected by the staff of the Board's centralised control room at Westminster. This room is connected by teleprinter with each of the larger works and the output of gas is continuously surveyed and regulated so as to meet the expected demand. Except for general supervision, the control room staff do not assume any control over calorific value.

Automatic Control Difficult

The control of calorific value is complicated by alterations in demand and it is for this reason, if for no other, that automatic control is often difficult and sometimes impossible. Very few automatic controllers are in operation and it is more usual to find some system of manual control such as that which has been described.

● *Industrial Gas Sampling*

By R. S. Medlock and H. Wilson

(GEORGE] KENT LTD.)

A SATISFACTORY sampling system must deliver a truly representative sample of the gases, with minimum delay and in a suitable condition for analysis. When used to provide a continuous sample, the system must be reliable, with the minimum of maintenance, for long periods of time. To make such a system possible the best position for taking the same must be found and the best means of transferring, cooling and cleaning the sample without undue delay or change in composition must be worked out.

The problems concerned with these two conditions are divided up under two main heads: (1) Sampling position, and (2) Alteration in composition of sample during transfer.

(1)—Sampling Position

(*a*) *Stratification*, which tends to occur when there is a variation in gas composition across the section of the duct and is most serious in the vicinity of combustion processes, but becomes less as the flue gas journeys on to the exit of the plant.

(*b*) *Stagnation*, or 'dead spaces,' in which the gas composition can change only slowly, occurs in the vicinity of abutments, on the inner radius of sharp bends, or at sudden enlargements in flue cross section.

(*c*) *Air inleakage*. When combustion products are being sampled, the flue gas pressure is balanced with the atmosphere or is slightly negative. The sampling position must, therefore, be chosen so that the possibility of air inleakage cannot occur before the sample is taken.

(2)—Alteration in Composition of Sample During Transfer

(*a*) *Further combustion*. By sampling near the combustion zone, the gases are sampled at temperatures at which further reaction is possible in the sampling tube. This can be prevented by use of a water cooled probe, thus 'freezing' the gas composition.

(*b*) *Catalytic combustion*. The filter or sampling tube may act as a catalyst permitting reactions between the components of the gas at a temperature below that normally possible.

(*c*) *Chemical reaction* between the sampling tube and sampling line materials must be avoided as this will block the sampling line with corrosion products and modify the gas composition.

(*d*) *Condensation*. Most sampled gases contain water vapour in considerable quantities, with a dew point temperature above ambient. Any water condensed from a cooled gas sample may dissolve small quantities of soluble gases from the sample.

To prevent condensation gas temperatures may be maintained above the dew point or cooling may be allowed to take place and adequate drainage paths provided to prevent blocking of the sampling lines.

(*e*) *Dust content*. Industrial gases are seldom free enough from smoke and dust particles for an analysis to be made without prior cleaning. Dust should preferably be eliminated before it enters the sampling tube to prevent blockage, but this is not always possible.

(*f*) *Sample disposal*. When the sample gas is toxic or obnoxious, its disposal after analysis is important. If analysis is by absorption no special difficulties arise, but when physical properties are being measured and the composition of the sample is unaltered, it is sometimes necessary to absorb it chemically after analysis or return it to the plant.

A sampling tube is used to convey a sample of gas from the inside of the flue or vessel to some convenient external position. These may be uncooled metal tubes, cooled metal tubes, or ceramic or glass tubes.

Standard mild steel pipes may be used, especially for many flue gas sampling applications. The tube is usually about 1 in. o.d., and is fitted with a refractory filter at the entry, but the maximum recommended operating temperature is 300°C., since above this temperature, errors due to oxidation effects are possible. The sampling tube may have a liner of ceramic material which serves not only to reduce the bore to ¼ in. diameter, thereby reducing lags to a minimum, but also provides an inert surface to the gas. Under these conditions an

unprotected mild steel probe can be used up to 500°C. Heat resisting steels of the 18/8 variety, which are not prone to rapid oxidation below 800°C. can be safely used up to this temperature. But the mechanical properties of these steels are very poor between 700°C. and 800°C., and are liable to sag if they are more than a few feet long or have to support a filter.

A water cooled tube is used either to 'freeze' a sample to prevent further change in gas composition after sampling, or to permit sampling at temperatures in excess of those possible with uncooled metal tubes. For sampling combustion gases the water cooled tube is usually made of mild steel. This should have a reasonable corrosion resistance, be strong, cheap and easy to fabricate by welding or brazing and readily available in a large range of sizes.

A well designed tube should be small in diameter and so reduce the amount of cooling water needed with the minimum surface area exposed to the high temperature. The cooling water passages should be kept small for maximum heat transfer and the bore of the gas entry tube should be small enough to prevent sample transfer delay. Limitations are imposed by practical considerations, so that a tube of o.d. of 3 in. is a good compromise for continuous operation. Considerable quantities of suspended matter may be contained in cooling water supplies, which limit annuli to ¼ in. radial dimensions.

Refractory sampling tubes of ceramic or glass are used either for temperatures in excess of uncooled metal tubes, or for prevention of chemical reaction with the sample. They are limited in their industrial use due to their extreme fragility, and should be protected by heat resisting tubes for as much of their length as possible.

Such tubes are silica for temperatures up to 900°C., glazed porcelain up to 1,400°C., mullite up to 1,700°C., and recrystallised alumina up to 1,900°C.

Minimum Time Lags

The sampling line which connects the sampling tube to the analysing equipment or collecting vessel must not react chemically with the gas or its condensation products. The bore should be small and the total length kept as short as possible for minimum transfer time lags. A bore of ¼ in. is generally agreed to be the practical minimum for industrial waste gas sampling. One of the most satisfactory types of sampling line for general use is armoured lead pipe and a range of adaptors has been developed for this pipe which are not affected by corrosive conditions. Iron and copper pipe is only satisfactory when corrosive components of the gas are absent. Glass, polythene, saran and P.V.C. pipes have also been used and are admirable in their resistance to corrosion, but the frailty of glass and the low temperature resistance of plastics limit their application. Silicone rubber tubing has a high temperature resistance, but it rapidly disintegrates when used with flue gases from coal fired boilers.

Elimination of the dust is one of the most difficult operations in continuous gas sampling. Filters and precipitators can easily be overburdened, and it is therefore desirable to use all possible means of minimising the duty by primary devices such as dust shields or shaped sampling tube entries. Primary filters, fitted on the end of the sampling tube, provide an excellent first-line defence against dust. These are made from refractory materials and are able to withstand temperatures up to 1,000°C. They are generally used for the dry dusty conditions experienced with pulverised fuel boiler flue gases and similar applications, and are capable of continuous operation for long periods (three to four months) without cleaning being required. With temperatures above 800°C., the mounting of a filter is usually beyond the mechanical strength of the materials available without suitable supports, and open ended tubes are used. The entries can be shaped in a similar manner to that previously described, compressed air being applied at intervals to keep clean. The temperatures at which water cooled tubes are used generally preclude the use of a filter at the intake.

The purpose of a filter is to remove dispersed solids and liquids from the gas sample. The selection of a filter often involves a compromise. The filter may be extremely efficient in particle removal but not meet other desired conditions. In addition to particle removal the filter must (1) be inert or highly resistant to attack by gas constituents, (2) be able to withstand operating temperature conditions, (3) be easily cleaned or replaceable, (4) have a suitable pressure drop at operating flows, (5) have ample 'dirt capacity' without introducing excessive delays in the gas transfer, (6) be free from leakage, (7) be resistant to blockage by condensation.

Small electrostatic precipitators have been designed for inclusion in gas sampling systems which make use of standard gas piping. Although maximum efficiency is claimed over the particle size range of 0.1-150 microns, and is theoretically independent of particle size, the relative ease of removing large particles by other methods limits the use of precipitators to 15 microns and below. For maximum efficiencies of 90%-98%, gas velocities should be 3 ft. per second or less, and operating potentials as high as permissible without sparking. The potential at which this will occur depends on the density of the gas, the dielectric constant and the concentration of dust. A serious problem with electrostatic precipitators is the overloading of the power supply by low resistance paths formed by acid condensate. This could be avoided if the temperature of the equipment was raised above the dew point, but the presence of acid may cause the dew point to be too high for practical purposes. Automatic dust removal from the grounded electrode can be carried out by periodic vibration or tapping. For perfectly dry gases, electrostatic charges on filter material have been used to increase the efficiency of filtering. The filter can be either P.T.F.E. shavings or a medium which is coated with an insulating resin. It generates its own electrostatic charge by friction with the gas flow. This material has a very limited application, since it is often inconvenient to maintain the gas sample in a dry condition.

Scrubbers may be defined as devices in which liquid is employed to achieve or assist in the removal of dusts from the gas. Water is usually, but not necessarily, used as the scrubbing agent. Several means of scrubbing are used. Among these are impingement, by which the dust laden gas is scrubbed by a high velocity liquid spray, diffusion, in which very fine particles, 5 micron and below, interspersed between liquid droplets, become attached to the droplet by Brownian motion and condensation. If a vapour is cooled below its dew point in the presence of solid particles, the latter act as condensation nuclei and are carried down with the liquid droplets, the increase in effective particle size simplifying the subsequent collection by mechanical means.

Only in recent years has automatic control from gas analysis measurement been seriously applied. This has stimulated a study and development of aspirators and pumps, since these devices largely control the sampling lag, an important quantity in the controllability of the plant. The sampling lag is particularly grievous as it has the characteristic of a distance/velocity lag, and therefore has a most serious effect on the control loop. The aspirating device has to be considered in conjunction with the sampling system as a whole, and one of the first things to be decided is whether the gas sample has to be delivered to the analyser under a positive or negative pressure. The former is obviously desirable, since a pressurised system does not give errors of measurement in the presence of small leaks. The pressurised system can also have the advantage of incorporating the gas scrubbing procedure. However, provided the analysis and sampling system can be given adequate protection by ordinary filtering, and provided that the system can be guaranteed against leaks, then the suction type of aspirator will provide the smaller lag.

The most common types of aspirators and pumps for continuous sampling are the sprengel pumps and some form of injector, centrifugal fans, and mechanical pumps.

Source of Problems

Aspiration problems would be enormously simplified if there were available a thoroughly reliable electrically driven pump with a long life, high discharge and with ability to withstand condensation, corrosive conditions and grit. Attempts to utilise pumps designed for other purposes have been made but have not met with any significant success.

The majority of sampling problems can be traced, directly or indirectly, to condensation from the gas sample.

In combustion processes water vapour is produced either by evaporation of water contained in the fuel, or by the combination of hydrogen compounds in the fuel with combustion air. The products of decomposition include carbon dioxide in fair measure, together with traces of sulphur dioxide SO_2, sulphur trioxide SO_3, and hydrochloric acid. The sulphur gases are formed by combustion of sulphur in the fuel with

oxygen, and the hydrochloric acid by the decomposition of sodium chloride which is present in some coals. The four constituents—CO_2, SO_2, SO_3 and HCl—are soluble in water and form acids. These acids are troublesome not only on account of their corrosive nature, but because they affect the dew point of the flue gas. It has been shown that, in the absence of sulphur in the fuel and 25% excess air, the dew point of the flue gas is approximately 45°C., while the presence of 1% sulphur can raise this dew point to about 130°C. by the formation of only 0.0015% by volume of SO_3.

Critical Temperature

For water tube boilers the first dew point, known as the 'acid dew point,' varies from 120°-150°C. Flue gases are invariably sampled above this temperature, but somewhere in the sampling tube or line the sample will reach a critical temperature at which acid dew will be deposited. The concentration of acid in this dew is a function of temperature and water content of the gases, but the initial deposit contains about 80% H_2SO_4. As the temperature decreases further, more dew is deposited, but successively weaker. Some of the sulphuric acid is deposited on the sampling tube and the rest is carried away in the gas stream as a fog to wreak further trouble in the cooler part of the sampling system. This acid fog is particularly difficult to eliminate as it is so stable. Even water washing fails to deal with it completely. It can be a source of error in analytical instruments depending on thermal conductivity measurements, as the fog particles absorb heat from the catharometer wire to regain the vapour phase, and this causes an apparent increase in the thermal conductivity of the gas. It is the presence of this fog which is responsible for the overloading of electrostatic precipitators. The fog can be eliminated by raising the temperature again above the dew point, but the presence of acid means that this dew point is probably above 100°C. Further research is required into the best method of eliminating this fog. Probably the condensation scrubber is the most successful, but not always the most convenient.

All sampling tubes (other than water cooled one) should slope downwards in the direction of gas flow. More specifically the hydraulic gradient of the sampling tube should have the same direction as the temperature gradient. Sampling lines should follow the same rule but, providing the temperature of the sampling line is below 100°C., the rule is not so important as reboiling the condensate does not occur. The important feature of a successful sampling system is the provision of slopes of at least 1 in 12 to drain away condensation, and at points where the direction changes from a falling to a rising gradient, provision is made for withdrawing the condensate. This is done by a liquid seal or trap taking the form of a U-tube filled with water, or a vertical tube dipping into a vessel containing water. As the water in these vessels occasionally evaporates faster than the rate of condensate arrival, it is advisable to fit them up with a continuous water supply and a drain.

Most analysis equipment can deal satisfactorily with a gas sample which is saturated with water vapour but is cool and free from fog and dust. Occasionally the gas sample is required in a dry state, in which case it can be passed through a vessel containing desiccants such as sulphuric acid, calcium chloride or phosphorous pentoxide.

Serious blockage can result if the location of an uncooled sampling tube does not comply with the rule that the hydraulic and temperature gradients should be in the same direction. The condensate laden with corrosion products and dust will start to run down the tube to the hotter parts. It will eventually boil off again and deposit its solids. In the cooler parts of the tube, the vapour will condense again and repeat the process until, in a matter of perhaps a few hours, a solid plug will have formed across the sampling tube. Water cooled tubes do not suffer from this problem to the same extent as the temperature gradient is destroyed by the water cooling.

Additional Water Purge

The formation of condensate wets the surface of sampling lines and encourages the deposition of dust. If sufficient condensate is formed it can wash all solids away, but occasionally the dust content is so high relative to the condensate formation that a damp deposit clogs the sampling lines. The solution to this problem is to provide an additional water purge to the sampling system which augments the condensate.

The formation of high sulphuric acid concentrations at the dew point, together with the chemical reducing conditions, the possibility of hydrochloric acid being present and the high temperature, all combine to make the corrosion potential difficult to deal with. The best quality stainless steels and other recognised alloys of high corrosion resistance are unsatisfactory for these conditions. Ceramics have proved to be resistant but have poor mechanical properties. A satisfactory combination is the use of a mild steel or stainless steel tube supporting a line of ceramic interlocking beads.

● *Recent Developments in Recording Gas Calorimetry*

By J. R. Kenward

(SOUTH EASTERN GAS BOARD)

THE need for apparatus for testing and automatically recording the calorific value of town gas increased as the transition from the illuminating standard to the thermal standard took place, and its use became essential with the 1920 Gas Regulation Act. This Act empowered the Board of Trade to issue orders authorising gas undertakings to charge for gas on a British Thermal Unit basis. It became an offence, in the legal meaning of the Act, for an undertaking to supply gas which was deficient in pressure, purity or calorific value. The provision of a continuous recording calorimeter, sufficiently trustworthy to merit its use as an automatic indicator of the extent to which the legal obligations of the gas undertakings had been fulfilled, therefore became a necessity. These same statutory requirements were embodied in the Gas (Quality) Regulations 1949, and still operate in a very similar manner.

Since the calorific value of a gas is defined as the number of B.Th.U. in 1 standard cu.ft. of the gas, and the B.Th.U. is defined as the amount of heat required to raise the temperature of 1 lb. of water by 1°F. from 59°F., a recording calorimeter must therefore include apparatus for measuring out a known quantity of gas precisely. In addition, provision must be made for measuring the amount of heat liberated when the gas is burned. The gross calorific value of gas is defined as the number of B.Th.U. produced by the combustion of 1 cu.ft. of gas measured at 60°F. under a pressure of 30 in. of mercury and saturated with water vapour.

Correcting Variations

The basic essentials of water flow calorimeters are means for maintaining a desired rate of flow of gas and water, means for burning the gas, and means for measuring the temperature rise of the water. Since normal atmospheric variations cause errors as large as ± 40 B.Th.U., and since the recorded calorific value must have an error no greater than ± 1 B.Th.U., it will be realised how essential are corrections for conditions varying from 60°F. and 30 in. of mercury. Different methods of correcting for these variations have been applied by manufacturers of various types of recording calorimeters. One of the earliest instruments was that designed by Professor C. V. Boys, and the principle of the recorder was that the rate of

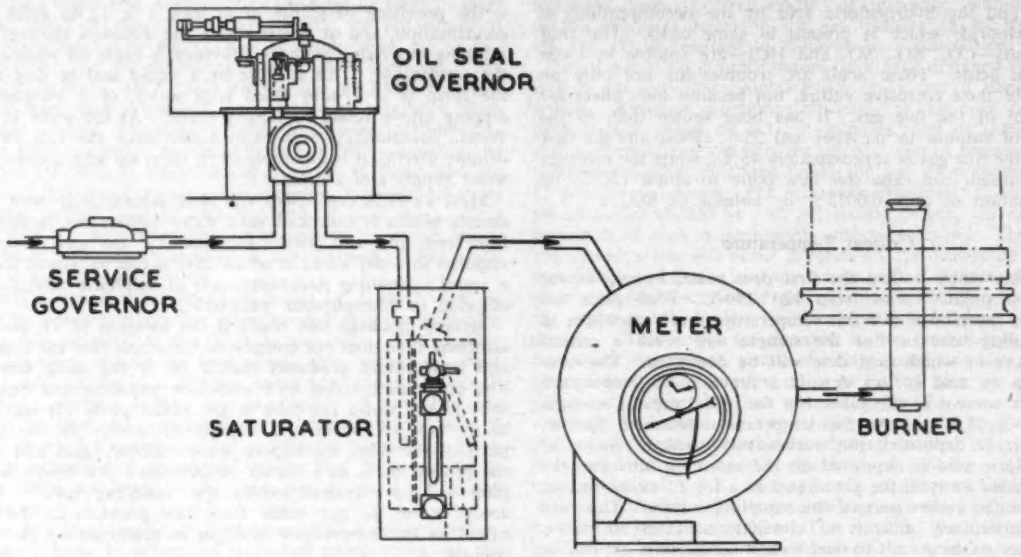


Fig. 1. Arrangement of pressure control to burner.

water flow was kept constant but the gas rate was automatically altered proportional to variations in atmospheric conditions.

In the Fairweather recording calorimeter (Mk. I) the gas rate is kept constant and the water rate modulated by alterations in the temperature of the inlet water to the calorimeter and in the atmospheric pressure. The possibility of errors arising due to different degrees of saturation of the gas with water vapour is eliminated by arranging for the gas to be cooled and saturated at the temperature of the inlet water to the calorimeter.

In the modified Fairweather recording calorimeter (Mk. II) the essential requirement of the gas supply system is that it shall continuously deliver gas to the instrument at a predetermined gas rate controlled within very close limits. The rate selected is 5 cu.ft. per hour, and, since the calorific value to be measured is generally 500 B.Th.U. per cu.ft. for town gas, it is important that the error should not exceed ± 1 B.Th.U., so that the control of the gas rate must have an error not greater than ± 0.1%. This has to be achieved even though the pressure and specific gravity of the gas may alter. Since a pressure controlled system can never prove completely effective, the following method is adopted. Fig. I shows that the gas from the main passes first to a primary single diaphragm dry governor where the gas pressure is reduced to 1½-2 in. W.G. The gas then passes to a sensitive oil-sealed governor, which accurately controls the pressure to 0.5-0.6 in. W.G. If the gas were fed direct to the burner, therefore, its flow rate would remain within close limits if it were not for variations in specific gravity. Some variation in specific gravity is inevitable and unless means other than pressure control were applied this would affect the gas flow rate. Control is therefore provided by a wet meter fitted with an escapement mechanism, Fig. II. The gas meter passes 1/12 cu.ft. of gas per revolution, and the escapement arranges that one revolution of the meter takes place in exactly one minute. This is accomplished by the escapement mechanism receiving 60 electrical impulses per minute from a mercury switch mounted on the pendulum of a standard Pulsynetic clock. A spring mechanism is interposed between the escapement and the meter shaft which acts as a buffer smoothing out the movement given by the second impulses.

Restoring Gas Flow

The spring between the escapement and the meter can take up any desired tension, and if the meter rotates faster than the escapement, then the coupling spring increases its tension. If, for example, the gaseous specific gravity decreased, the pressure at the governor outlet would stay unaltered, so if the meter with escapement were not present the gas flow rate would increase. With the meter installed, however, the increased gas rate tends to rotate the meter drum more quickly than the escapement control will permit, causing the torque in the connecting spring to increase. This increased torque in turn increases the differential pressure across the meter thus restoring the gas flow rate to its original value.

The gas and air for combustion are both cooled and saturated to the inlet water temperature. The gas is then burned in the calorimeter. In the modified Boys calorimeter the effluent products are reduced in temperature to within 5°F. of the inlet water temperature. At this temperature difference the heat lost in the effluent products is compensated for by the increased heat gained from the water condensed, due to the contraction in volume of the gas and air during combustion. The final requirement for calorific value measurement is therefore a record of the difference between inlet and outlet water temperatures to and from the calorimeter. A system of electrical recording over a range of 500 B.Th.U. is employed.

Alternative Method

In the older instruments the gas supply was kept constant and the water rate was modulated to compensate for changes in atmospheric conditions. The variations in pressure and volume of air sealed in a metal chamber were communicated to a float in a float chamber and this, in turn, varied the head to maintain the water flow through the calorimeter, proportional to atmospheric conditions. These components, however, were large in size so this chamber has now been eliminated and an alternative method of electrical compensation substituted.

The electrical compensator, illustrated in Fig. 2, enables

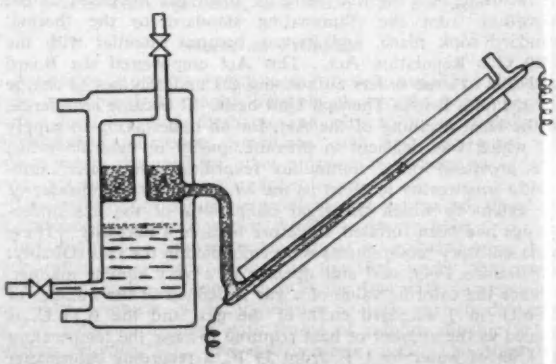
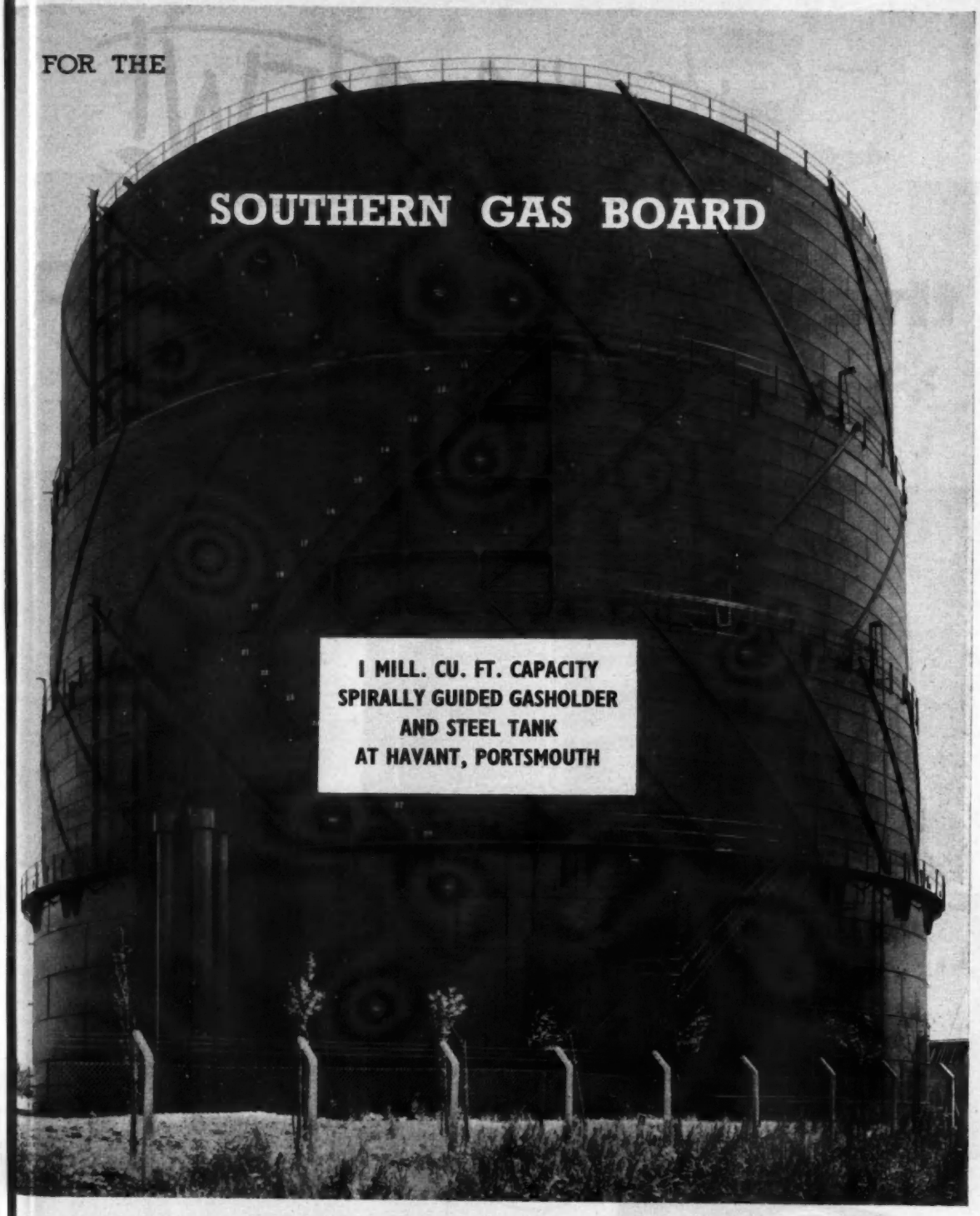


Fig. 2. Tabular compensator.



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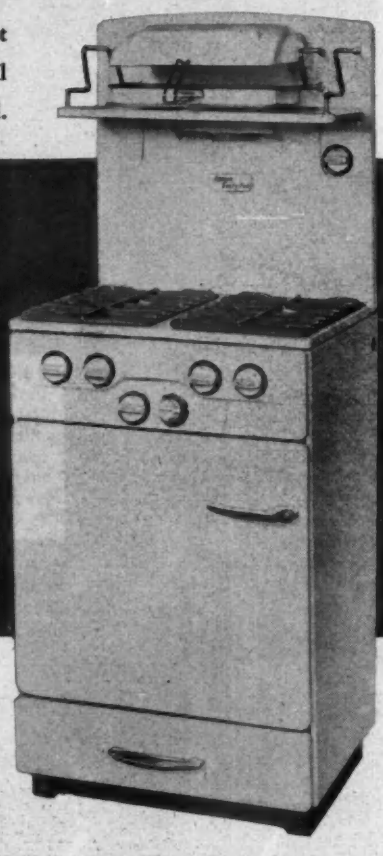

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a small volume of air to be trapped within the inverted bell shape by the mercury. The chamber which holds the entrapped air consists of two compartments, one above the other, the two being connected by a vertical tube. For calibration purposes, therefore, it is possible to vary the total volume of entrapped air by introducing different volumes of water into the lower compartment of the vessel. This water serves the additional purpose of saturating the air entrapped. The whole of this glass system is surrounded by a water jacket through which water at the temperature of the inlet water to the calorimeter flows continuously so that the entrapped air is maintained at this temperature. The other, narrow, arm of this 'J tube' is inclined to increase the magnification, and is open to the atmosphere at the outer end through a sintered glass filter to prevent contamination with dust. Variations in barometric conditions or changes in inlet water temperature cause an expansion or contraction of the entrapped air and therefore a movement of the mercury. This movement is detected as a change in electrical resistance. A platinum/iridium wire runs the length of the narrow tube, the operative electrical resistance of which is between the upper end of the wire and the mercury level. The resistance is incorporated in one of the arms of a Wheatstone bridge and provides electrical compensation in the recording system for variations in atmospheric conditions by altering the out of balance current which is a function of calorific value. It is a compact device (10 in. by 5 in. by 9 in.) and may be of use for providing compensation for pressure and temperature changes, not only for calorific value determination but also for other purposes. The correction to the gas volume which the compensator furnishes is actually in the form of the 'tubular number,' a composite figure which expresses variations due to temperature, pressure, and humidity and which is used as such in the gas industry.

Its magnitude is equal to $\frac{17.617\ (h - a)}{459.4 + t}$

where t = temperature in °F., h = pressure in. of mercury, a = vapour pressure in in. of mercury.

Since the room in which the instrument for official gas testing purposes is housed is locked and the key is in the possession of the gas examiner, it is obvious that two very stringent requirements must be met; 1. accuracy, and 2. reliability.

In the instrument room, therefore, the temperature is thermostatically controlled and dirt and dust are reduced to minima so these problems, though difficult, are not insuperable and the 21 Fairweather recording calorimeters in the South Eastern Gas Board, working under these conditions, have given a continuity of performance in excess of 95% of the total running time.

● *The Measurement of 'Wobbe Index' and Its Importance for Certain Industrial Purposes*

By T. A. Lucas

(SOUTH EASTERN GAS BOARD)

THE Wobbe index applies only to inflammable gases and is given by:—

Wobbe Index = C.V./$\sqrt{S.G.}$ Where C.V. = Calorific value, and S.G. = Specific gravity. The Wobbe Index therefore has the units of calorific value. The significance of the Wobbe Index is that it gives an indication of the burning characteristics of town gas.

In the majority of cases burners are of fixed dimensions and pressures are controlled by governors so that the heat release from an appliance is a function of only Wobbe Index. It is for this reason that the Wobbe Index of manufactured gas should be maintained within close limits at the works. In the South Eastern Gas Board steps are taken to maintain the Wobbe Index of town gas within the specific limits ± 5%.

Principles of Operation

The Wobbe Index recorder is manufactured by the Sigma Instrument Co., Ltd. Gas entering from the mains system passes first to a primary pressure governor, which reduces the pressure to 1 in. W.G., and next to a very accurate, floating-bell type governor which controls the pressure to between 0.5 and 0.6 in. W.G. Finally, the gas passes through an orifice so that the flow rate is maintained constant provided no variations in specific gravity take place. From the orifice the gas passes to a burner, where it is burned within the inner of two concentric, vertical cylinders which are securely fastened together at their lower ends. The heat released causes a differential expansion of the tubes—the inner is more affected by the burner temperature than the outer—and a mechanical system amplifies up this small movement (only about 0.09 in.), finally actuating a recording pen of conventional type. Variations in room temperature affect each of the tubes to like extent so that the instrument is virtually unaffected by room temperature changes. Since the pressure is controlled at a constant figure, and the burner orifice is fixed in size, the heat release will vary inversely with the square root of the gaseous specific gravity and directly with the calorific value. The pen therefore records Wobbe Index.

It was found simple to adapt the instrument for use as an automatic controller, the Mk.20 controller manufactured by George Kent Ltd., as it was found suitable both as regards operating power, and space considerations.

The first industrial application of the instrument arose in connection with the manufacture of electric lamps. The factory concerned used town gas as an operating medium and despite the fact that both the calorific value and the Wobbe

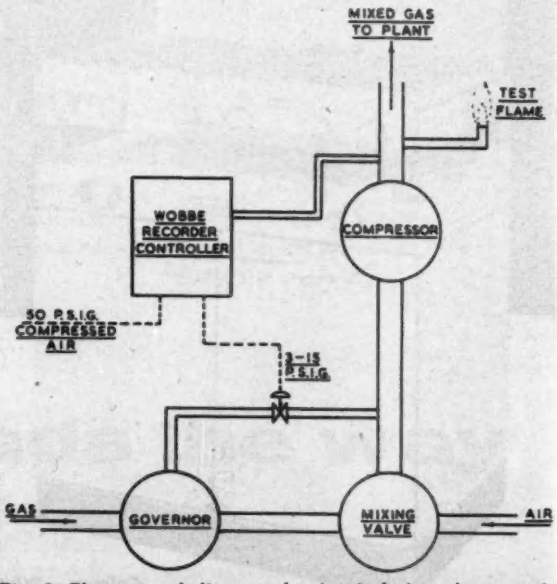

Fig. 1. Flow control diagram showing inclusion of automatic control of Wobbe Index on mixing machine.

Index of the gas supplied were carefully controlled at the manufacturing centre, some operating difficulties had been encountered from time to time.

The manufacture of electric lamps is an automatic process in which a variety of glass blowing operations, many of them of considerable intricacy, are carried out by machines capable of moving the various shaped pieces of glass at pre-determined rates through the flames of very large numbers of gas burners. The transportation rate through the burners is controlled mechanically and does not vary, once set, but for the glass blowing operation to be successful it is obvious that the heat transferred to the glass must be kept constant within close limits. It is therefore essential, that not only the heat release from each burner port but also the flame shape should remain the same. In horizontal burners, in particular, an alteration in flame shape can lead to a very different heat transfer to the glass material, even if the heat released by the flame is unaltered. To deal with this problem, Wobbe Index control of the air/gas mixture was instituted at the lamp factory. The operation of this system is intimately connected with the lamp making plant.

Automatic Mixing Machine

Town gas is supplied to an automatic mixing machine which supplies a mixture consisting of 40% gas and 60% air, delivering this mixture at some 60 in. W.G. pressure. The gas supply is through a governor which reduces the pressure to atmospheric. The gas flows to a proportioning and mixing valve into which is also admitted air at atmospheric pressure. The outlet of the proportioning and mixing valve is connected to the inlet of the compressor and under all conditions the pressure drop across both the air and gas ports of the mixing valve is kept constant. From the compressor the air/gas mixture is delivered to a ring main within the factory which in turn feeds the burners on the automatic machines. In addition, on the outlet main of the compressors of the mixing machine, a small test burner is fitted. The proportioning and mixing valve can be rotated about a vertical axis to alter, within safe limits, the ratio of air to gas supplied in the mixture. In addition, the rise and fall of the valve is actuated by means of suction or pressure on a diaphragm so that mixture volumes are regulated in relation to varying loads while pre-set air/gas ratios are maintained. The burners on the automatic lamp making machines are fed with the mixture, and extra air is added through needle valves from a supply at 80 in. W.G. pressure. The layout is shown in Fig 1.

Kept Constant

Mixed gas from the outlet of the mixing machine is fed to the Wobbe Index recorder controller which operates the control valve so that, independent of small changes in the Wobbe Index of the gas received, the Wobbe Index of air/gas mixture at the outlet of the machine is kept constant within very close limits.

The instrument selected had a range of 170-250 units of Wobbe Index and under working conditions the controller was found to maintain the Wobbe Index of the air/gas mixture within ± 1%.

Since the installation was put to work glass wastage has been reduced to about a quarter of the previous figure, and lost production time is also much less.

Tests have shown that Wobbe Index control gives better results in practice than flame shape control, perhaps because hydrogen with its low specific gravity is the constituent most likely to cause a change in Wobbe Index, and in addition is the gas with the highest flame speed, and so will most affect the flame shape of the burner mixture.

The potential value of the Wobbe controller may well be greatest in applications where variations in Wobbe Index are not the obvious difficulty. One such example is that of furnace atmosphere control, and in this case it has been found possible to maintain a furnace atmosphere slightly oxidising, not by controlling oxygen content as would seem logical but by controlling Wobbe Index.

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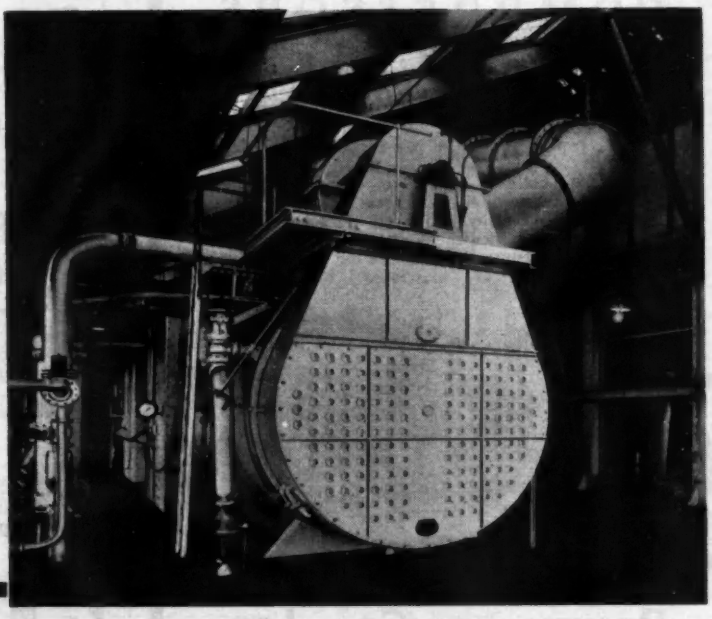

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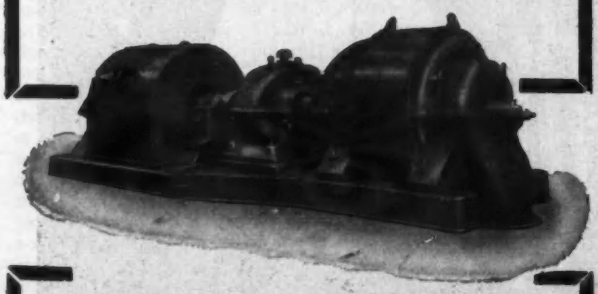

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PUBLISHERS' NOTICE

The " Gas Journal " is published every Wednesday, price 1/6d.; by post 1/9d.

Subscription Rates: Home 65/–; Overseas (from Sept 1, 1957) 72/6 per annum; (Both payable in advance.) A copy of the " Gas Journal " Calendar & Directory is presented each year to continuous subscribers.

Classified Advertisements: All small classified advertisements are charged at 2/6 per line (approx. 7 words)—minimum charge 10/–. A Box Number address occupies 2 lines, and a further 6d. is charged towards cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's Journal.

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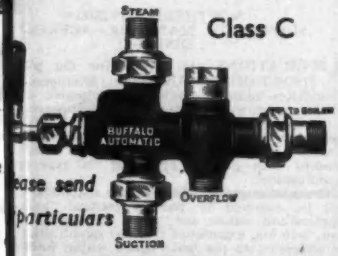

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(Founded by the Gas Plant Manufacturers' Development Council)

ONE Special Entrance Scholarship will be awarded to a suitably qualified candidate entering the University in October, 1958, to follow the normal three year course leading to a first degree in the Faculty of Science with honours in one of the following departments: Mechanical Engineering, Civil Engineering, or Chemical Engineering. Value, not exceeding £350 per annum, including fees. The scholarship will be awarded **without restriction as to parental means.** Preference will be given to candidates already employed in the Gas Plant Industry.

Further particulars and application forms may be obtained from the Registry, The University, Birmingham, 15. Intending candidates should write without delay.

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PRESSURE Vessels. 32' × 8' 6" dia. and 30' × 8' 6" dia. for 100 lbs. and 120 lbs. W.P. Insurance reports. Cleckheaton Engineering Co., Ltd., Cleckheaton, Yorks.

CAPACITY AVAILABLE. — SYPHON POTS, SURFACE BOXES and GAS WORKS CASTINGS. Specialists to Gas Boards throughout the British Isles. Berry's Foundry (1949), Ltd., Hammerton Street, Bradford, 3. 'Phone 27701.

UNUSED Audco lubricated valves at attractive prices. Send for list. Cleckheaton Engineering Co., Ltd., Cleckheaton, Yorks.

SPECIAL OFFER: Large quantity of new cast iron fullway valves, all iron parts, 8 in., 10 in., 12 in. and 14 in. for sale. The Midland Iron & Hardware Co. (Cradley Heath) Ltd., Cradley Heath, Staffs. Tel.: Cradley Heath 6264 and 5.

FOR Sale or for hire, Hudswell Clarke 0-6-0 Standard Gauge Steam Loco, in good condition. Apply, Eagre Construction Co., Ltd., Scunthorpe, Lincolnshire. 'Phone, 4513 (7 lines).

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LIGHT engineering company with good connections in Gas industry as a going concern. All or part of modern premises occupied by Company available on lease. Principals only. Address: No. 334, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

APPOINTMENTS VACANT

WANTED: CHIEF COKE OVENS CHEMIST. Applications stating age, experience, qualifications and salary required to be addressed to the Coke Oven Manager, Guest Keen Iron and Steel Co., Ltd., East Moors, Cardiff.

NORTHERN GAS BOARD

DARLINGTON DIVISION
SHOWROOM MANAGER

APPLICATIONS are invited for the position of SHOWROOM MANAGER at Darlington Unit.

Applicants should have a wide experience in salesmanship, modern sales methods and staff control.

The salary will be Grade APT. 8 Provincial 'A' (£745-£825 per annum) of the National Salary Scales.

The successful applicant will be required to pass a medical examination and join the Board's Pension Scheme.

Applications stating age, qualifications, details of experience and the names of two referees should be addressed to the undersigned not later than November 15, 1957.

F. WILSON,
Divisional General Manager.

Gas Office,
John Street,
Darlington.

October 23, 1957.

SOUTH WESTERN GAS BOARD

WESTON/TAUNTON DIVISION
DRAUGHTSMAN

APPLICATIONS are invited from suitably qualified persons for the position of DRAUGHTSMAN at the Distribution Department, Weston-super-Mare. Applicants, who will be directly responsible to the Divisional Distribution Engineer, should preferably possess the H.N.C. in Mechanical Engineering and should be experienced in the design of District Plant and Mains Layouts, preparation and maintenance of mains records and general Drawing Office work. Experience of route surveying, use of levelling instruments, etc., is desirable.

The salary for the post will be within Grades APT. 7/8 (£705-£825), commencing salary being determined according to age and experience.

Applications giving details of education, training and experience together with the names and address of two referees, should be addressed to reach the undersigned not later than November 18, 1957.

J. D. BUTLER,
Divisional Engineer and Manager.

30/32, The Boulevard,
Weston-super-Mare.

(*Classified advertisements continued on page* 310)

APPOINTMENTS VACANT (ctd.)

WALES GAS BOARD

RHYMNEY AND ABER UNDERTAKING
TECHNICAL ASSISTANT—DISTRIBUTION

APPLICATIONS are invited for the position of TECHNICAL ASSISTANT at a salary within Grade A.P.T. 5/7 (£605-£785 per annum) according to experience and qualifications. The post is pensionable.

Candidates should have had experience in high and low pressure distribution systems, and will be required to assist generally in all aspects of Distribution work including gas fitting. The successful applicant will be required to pass a medical examination.

Applications giving age, together with details of education and experience and the names of two referees, should be forwarded to reach the undersigned within 14 days of the appearance of this advertisement.

D. I. ROWLANDS,
General Manager.

Gas Offices,
St. Martin's Road,
Caerphilly.

WALES GAS BOARD

BANGOR AND DISTRICT UNDERTAKING
ENGINEER AND MANAGER

APPLICATIONS are invited for the position of ENGINEER AND MANAGER of the Bangor and District Undertaking (incorporating the former Bangor/Bethesda and Menai Bridge/Beaumaris Undertakings) at a salary within Group 'B' (£1,155/£1,315 p.a.) of the National Salaries Table for Senior Gas Officers. The appointment is pensionable.

The Bangor and District Undertaking receives gas in bulk from the North Wales Gas Grid. Applicants should possess the appropriate qualifications and sound experience in the distribution of gas and be capable of carrying out energetically the technical, administrative, commercial duties of the post, in particular the development of the sale of gas.

The successful applicant will be required to pass a medical examination.

Applications for the above appointment, stating age, qualifications, experience and present position, together with the names of two referees, should reach the undersigned not later than November 23, 1957.

C. B. MAWER,
Secretary.

2, Windsor Place,
Cardiff.

SOUTHERN GAS BOARD

DRAUGHTSMAN—ALDERSHOT/CAMBERLEY

APPLICATIONS are invited from suitably qualified persons for the post of DRAUGHTSMAN, Aldershot/Camberley Works.

The salary will be within Grade A.P.T. 5/6 (£605-£720) of the National Salary Scales for Gas Staffs, according to qualifications and experience.

The successful candidate may be required to pass a medical examination and unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required to join the Board's Staff Pension Scheme.

Applications, marked "Draughtsman—Aldershot/Camberley" at the top of the letter of application, should be accompanied by a separate sheet showing name, age, education, experience and present appointment, together with any other relevant supplementary information, in that order, and should be addressed to reach the Personnel Manager, Southern Gas Board, 164, Above Bar, Southampton, by November 14, 1957.

SOUTHERN GAS BOARD

SENIOR ASSISTANT ENGINEER—READING

APPLICATIONS are invited from suitably qualified persons for the post of SENIOR ASSISTANT ENGINEER, Reading Works.

Applicants should be Associate Members of the Institution of Gas Engineers, or have an equivalent qualification, and have some experience of a Works with a production exceeding 5 million cubic feet daily.

The salary will be within Grade A.P.T. 9 (£795-£895) of the National Salary Scales for Gas Staffs, according to qualifications and experience.

The successful candidate may be required to pass a medical examination and unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required to join the Board's Staff Pension Scheme.

Applications should be made on a special form to be obtained from the Personnel Manager, Southern Gas Board, 164, Above Bar, Southampton, and returned to him by November 14, 1957.

SOUTHERN GAS BOARD

ASSISTANT ENGINEER—ALDERSHOT

APPLICATIONS are invited from suitably qualified persons for the post of ASSISTANT ENGINEER, Aldershot Works.

Applicants should be Associate Members of the Institution of Gas Engineers, or have an equivalent qualification, or be making good progress towards that end.

The salary will be within Grade A.P.T. 7 (£705-£785) of the National Salary Scales for Gas Staffs, according to qualifications and experience.

The successful candidate may be required to pass a medical examination and unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required to join the Board's Staff Pension Scheme.

Applications should be made on a special form to be obtained from the Personnel Manager, Southern Gas Board, 164, Above Bar, Southampton, and returned to him by November 14, 1957.

SOUTHERN GAS BOARD

DRAUGHTSMAN—READING

APPLICATIONS are invited from suitably qualified persons for the post of DRAUGHTSMAN, Gasworks, Reading.

The salary will be within Grade A.P.T. 5/6 (£605-£720) of the National Salary Scales for Gas Staffs, according to qualifications and experience.

The successful candidate may be required to pass a medical examination and unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required to join the Board's Staff Pension Scheme.

Applications, marked "Draughtsman—Reading" at the top of the letter of application, should be accompanied by a separate sheet showing name, age, education, experience and present appointment, together with any other relevant supplementary information, in that order, and should be addressed to reach the Personnel Manager, Southern Gas Board, 164, Above Bar, Southampton, by November 14, 1957.

EASTERN GAS BOARD

(CAMBRIDGE DIVISION).
TECHNICAL ASSISTANT—BEDFORD DISTRICT

APPLICATIONS are invited for the above position. The salary will be within Grades A.P.T. 5/6 of the National Joint Council for Gas Staffs, Provincial 'A' Scales.

The successful candidate may be required to pass a medical examination and unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required, if eligible, to join the Board's Staff Pension Scheme within six months from taking up the appointment.

Candidates should possess a Certificate of the Institution of Gas Engineers (Manufacture), or its equivalent and be experienced in the operation and control of all gas manufacturng and ancillary plant.

Applications stating age, qualifications and experience together with the names of two Referees should reach the undersigned within 14 days of the appearance of this advertisement.

J. HUNTER-RIOCH,
General Manager.

52, Sidney Street,
Cambridge.

EASTERN GAS BOARD

(CAMBRIDGE DIVISION)
TECHNICAL ASSISTANT (DISTRIBUTION)

APPLICATIONS are invited for the position of TECHNICAL ASSISTANT (Distribution) at the Divisional Chief Office at Cambridge.

Applicants should have had good practical experience of main and service laying and in the operation of a Distribution Department of a medium or large undertaking. They should also possess the Higher Grade Certificate of the Institution of Gas Engineers in Gas Engineering (Supply), or equivalent qualification.

The successful candidate will be required to assist in the preparation of all types of mainlaying projects, including the design of housing estate layouts, feeder and trunk mains and integration mains.

The salary will be within Grade A.P.T. 9 Provincial A (£795 to £895) with placing according to age and experience.

The successful candidate will be required to pass a medical examination and, unless already subject to a Pension Scheme, by virtue of the Gas (Pension Rights) Regulations, 1950, will be required, if eligible, to join the Eastern Gas Board Staff Pension Scheme within six months from taking up the appointment.

Applications giving full details of training, qualifications and experience, together with the names of two referees, should be sent to the General Manager, Eastern Gas Board (Cambridge Division), 52, Sidney Street, Cambridge, by November 20, 1957.

SOUTHERN GAS BOARD

TECHNICAL ASSISTANT
UTILISATION

APPLICATIONS are invited from suitably qualified persons for the post of Technical Assistant (Utilisation) to the Commercial Manager.

The starting salary for the post will be between Grades 'D' and 'F' (£1,375 to £1,925) of the National Salary Scales for Senior Gas Officers, by arrangement with the successful candidate according to qualifications and experience.

Applicants should be fully conversant with aspects of gas utilisation, the development and design of gas appliances and equipment, and be capable of advising on the traditional and non-traditional materials for modern gas fitting.

A University Degree in Science or Fuel Technology or an equivalent qualification, would be an advantage.

The successful candidate may be required to pass a medical examination and, unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required to join the Board's Staff Pension Scheme.

All applications must be made on a form which may be obtained from the Personnel Manager, Southern Gas Board, 164, Above Bar, Southampton, and completed forms should be returned to him by November 22, 1957.

SOUTHERN GAS BOARD

ASSISTANT COMMERCIAL MANAGER

APPLICATIONS are invited for the appointment of an ASSISTANT COMMERCIAL MANAGER at a commencing salary of not less than £2,000 per annum or by arrangement with the successful candidate.

Applicants must have had extensive administrative and marketing experience and be capable of organising sales promotion campaigns for the development of the use of gas for domestic, commercial and industrial purposes.

The successful candidate may be required to pass a medical examination and, unless already subject to a Pension Scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required to join the Board's Staff Pension Scheme.

All applications must be made on a form which may be obtained from the Personnel Manager, Southern Gas Board, 164, Above Bar, Southampton, and completed forms should be returned to him by November 22, 1957.

SCOTTISH GAS BOARD

GLASGOW AND WESTERN DIVISION
GLASGOW DISTRICT

APPLICATIONS are invited from suitably qualified persons for a post as CHIEF ADMINISTRATIVE CLERK at the Consumer Service Centre, Wallace Walls Street, Glasgow. This Centre will operate as an integral part of all Departments concerned with consumer service.

The Centre will plan and progress appliance installations and all maintenance work. It will deal with all enquiries from consumers, covering gas supply, coin meter maintenance and installation progress.

The successful applicant will have control of staff and must possess organisational ability at administrative level, together with capacity to initiate and apply new methods. A knowledge of consumer service would be an advantage but is not essential.

The post is pensionable and the successful applicant will be required to pass a medical examination.

The appointment will be within the Scale (Provincial 'A') A.P.T. 10/11 (£860-£1,020 per annum), with placing therein according to qualifications and experience.

Applications marked 'C/S.' stating age and full particulars of education, training, qualifications and experience should be addressed to the Personnel Officer, 9, George Square, Glasgow, C.2, within 14 days of the appearance of this advertisement.

SCOTTISH GAS BOARD

NORTHERN DIVISION
SHOWROOM MANAGER—ABERDEEN DISTRICT

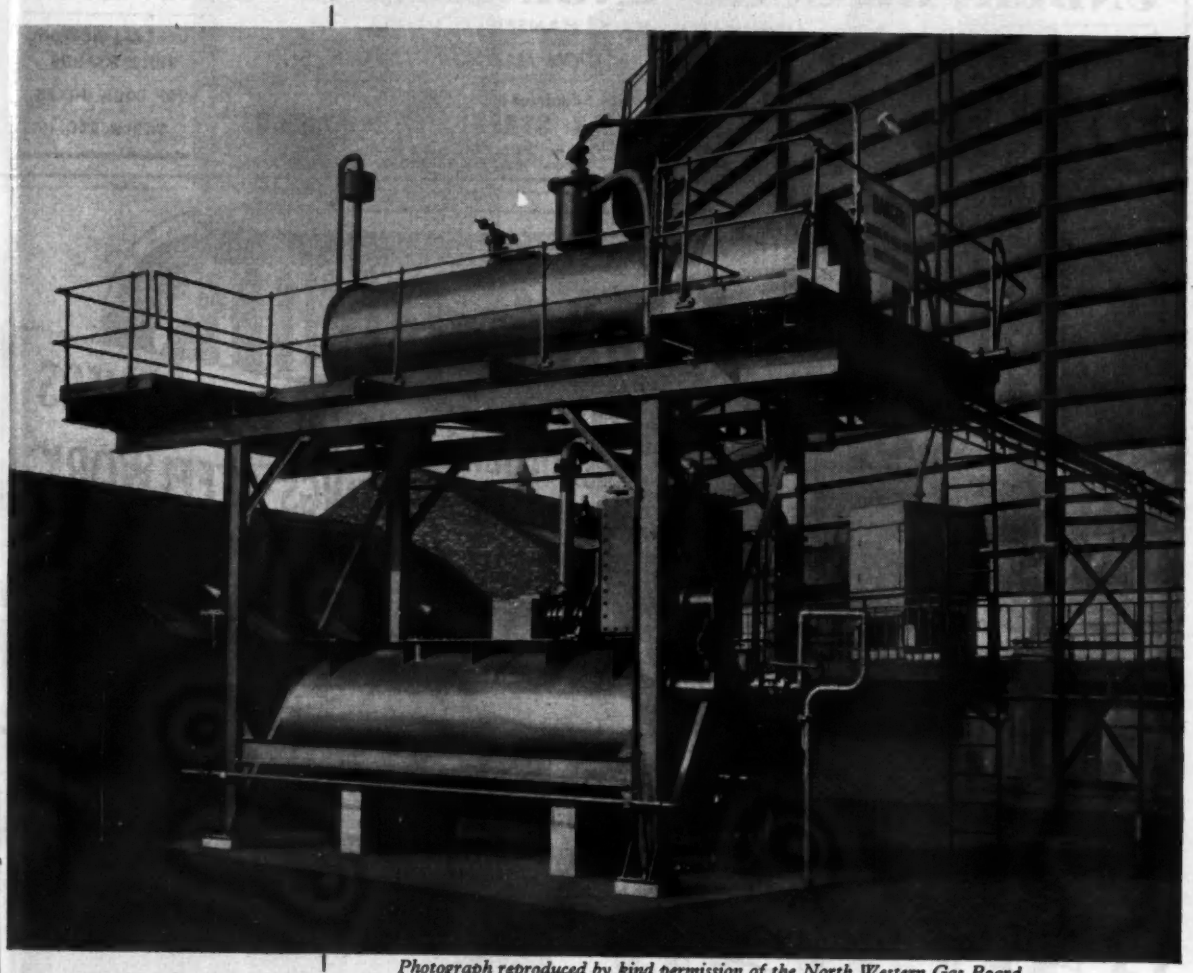
APPLICATIONS are invited for the position of SHOWROOM MANAGER (Aberdeen District). Candidates must have had considerable experience of showroom work (preferably in a supervisory capacity), consumer service and appliance sales work and general display practice. Salary will be within Grade A.P.T. 6, Provincial 'A' Scale (£640-£740 per annum) with placing according to experience and qualifications.

The post is pensionable and the successful candidate will be required to pass a medical examination. Applications stating age, giving full details of education, training, experience and any qualifications should be addressed to the undersigned within fourteen days of the appearance of this advertisement.

H. S. MILNE,
General Manager.

50, Cotton Street,
Aberdeen.
October 30, 1957.

WATERLESS HOLDER TAR DEHYDRATION PLANT



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The illustration shows the plant installed at the Bradford Road Works, Manchester, for dehydrating the sealing tar for the waterless holder.

This plant which is the first of its type is capable of handling 200-250 gallons of holder tar per hour containing 10-15% water by volume.

For the past year, since installation, holder tar has been maintained at a steady viscosity, and sludge and freezing problems have been eliminated.

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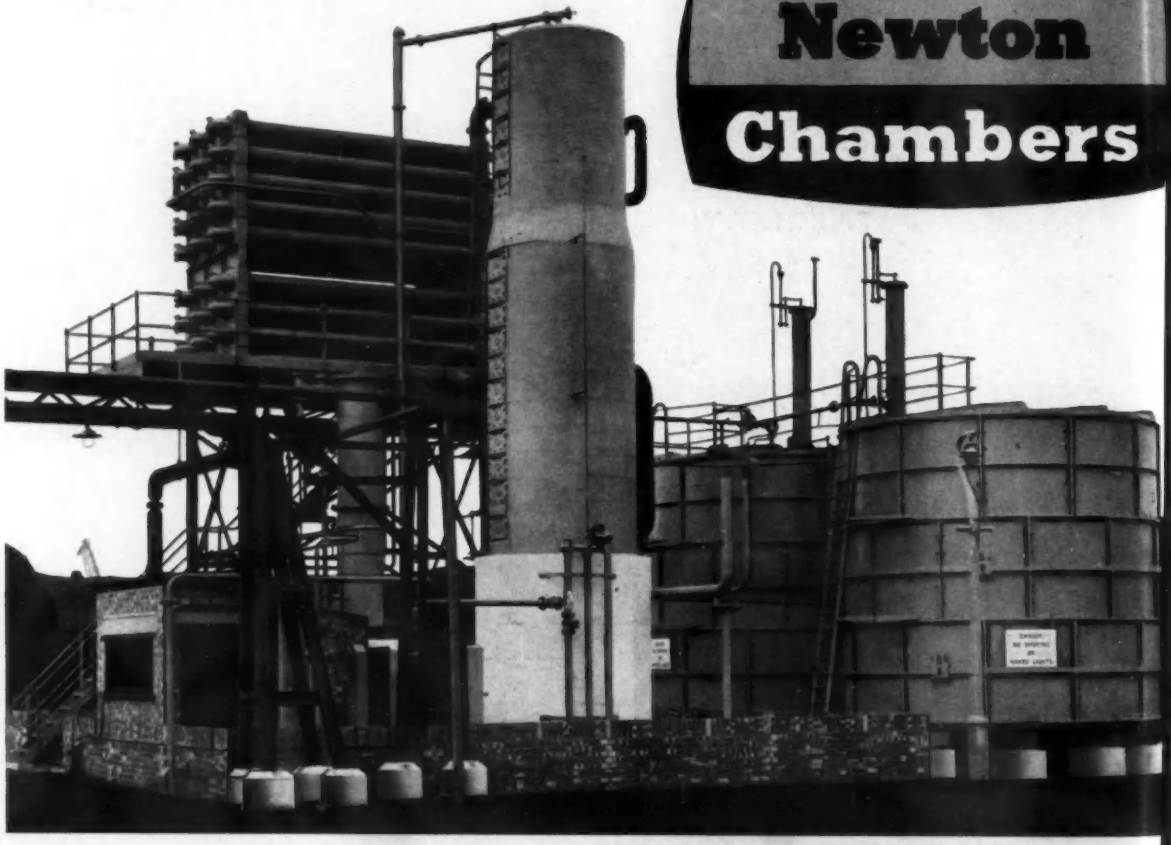

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